

# Sustainability and Student Research: Sowing Seeds for Another Tomorrow

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## Abstract

*Higher education can be a key leader in sustainability efforts, with issues cutting across all areas of functioning and extending into the community. This article examines educational change, which is particularly important because of its far-reaching effects. In particular, this article describes student-led sustainability research at the University of Louisville, demonstrating involvement and the ways that student work can make a real difference.*

We stand at a critical moment in Earth's history, a time when humanity must choose its future. As the world becomes increasingly interdependent and fragile, the future at once holds great peril and great promise. To move forward ... we must join together to bring forth a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace. Towards this end, it is imperative that we, the peoples of the Earth, declare our responsibility to one another, to the greater community of life, and to future generations.

Preamble to the text of *Earth Charter 2000*,  
United Nations Earth Summit

Institutions of higher education have key roles to play in change (Asquith 2007; Bardaglio and Putnam 2009; Barlett and Chase 2004). With sustainability, change ranges from reducing energy use to raising awareness; it spans from changing existing purchasing and financial practices to changing educational approaches. Our focus is on the last area, perhaps the most important because of the ripple effect it can create—student education and empowerment. As Bardaglio and Putnam (2009) stress, the critical charge for educators is enabling students *both* to imagine *and* act. However, evidence indicates that educational efforts have presented challenges and been slower to produce results than other campus initiatives (Carlson 2008).

Several factors influence the challenging nature of sustainability efforts on campus and impact the results of such efforts. Chief among these factors is the academy's disciplinary specializations and structures (Carlson 2008). Because understanding and teaching about sustainability requires broad-scale systems-oriented viewpoints, the undertaking can be challenging in many existing university structures, where sharply defined disciplinary divisions abound (Carlson 2008). However when groups of

students, often from different majors, come together to tackle sustainability issues, such barriers are more easily overcome.

This article examines sustainability work at the University of Louisville, a metropolitan university with nearly 22,000 students and 6,000 employees. First, an overview of the university and its sustainability efforts is provided. Next, the article describes student-led campus and community research, chronicling several projects and their inception, processes, outcomes, and lessons learned. Then, associated benefits and limitations are discussed. Finally, the concluding section explores future directions, including examples of synergy generated and ways that our work may serve other institutions and educators.

## **Overview of University and Sustainability Efforts**

Under President James R. Ramsey's leadership, the University of Louisville (U of L) has taken bold and visionary steps in becoming more sustainable in terms of operations and facilities, research and education, and community stewardship. As evidence of this continued commitment, the University of Louisville's strategic plan, *The 2020 Plan: Making It Happen*, includes a focus on creative and responsible stewardship that builds on the major sustainability efforts in operations, finance, research and education, and community engagement. In fall 2008, a Sustainability Council was established to provide oversight and direction, coordinate activities, and recommend policy regarding sustainability at the University of Louisville. The goals of the Council are to develop new policies and programs at the university to improve its operations in being more environmentally, socially, and economically sustainable; increase the breadth and scope of education, research, and outreach on this issue; and assure that financial investments are not detrimental to environmental sustainability. Coincident with the establishment of the Sustainability Council, the university undertook a \$35 million energy audit with the Siemens Corporation to assess and initiate changes in facilities and operations, guarantee energy savings, and establish a Center for Renewable Energy, which will support research and education in sustainability and engineering. These events added to a variety of other university activities related to environmental stewardship, including commitment to the Partnership for a Green City, participation in purchasing consortiums, support for the U of L/Jefferson County Public School's Center for Environmental Education project, and support for the Kentucky Pollution Prevention Center.

The U of L vision of sustainability is to use the campus as a living laboratory for teaching, research, and implementation of initiatives related to environmental, social, and economic sustainability. U of L has mobilized to establish increasing organizational support for academic research, education, and partnerships to address sustainability challenges facing Louisville and other metropolitan regions, and generate innovative solutions that enhance the natural environment, economic vitality, and social equity of cities worldwide. The goal is to engage students, faculty, and staff in gaining an understanding of our current patterns of environmental impact and the

consequences of these behaviors, as well as to educate citizens, professionals, and students to advance sustainability in their civic and professional lives. All of these efforts will help make the university, as a microcosm of the broader Louisville community, an exemplary model of viable sustainability.

The recent hire of the first Assistant to the Provost for Sustainability Initiatives (APSI) reflects the strong university commitment to sustainability issues. The work of this key person is multifaceted. This person is charged with developing and overseeing sustainability initiatives (as directed by the Chair of the Council) on campus. While managing day-to-day operations of the Council and its programs, the APSI also coordinates related sustainability programs of the university. For example, the APSI assists with the Green Threads program to integrate sustainability education into both new and existing courses offered at the university. In addition, to this work, the APSI also develops, obtains, and administers grants to support the Sustainability Council's initiatives. Associated with this work, the APSI may also hire and/or supervise staff, students, and volunteers and prepare reports, records, video productions, and other documentation of the Sustainability Council's initiatives and programs. A related area of work involves the creation and maintenance of the university's sustainability website. This website showcases the work of the Council as well as listing activities, schedules, and initiatives and provides a number of links to related items of interest. Another key facet of the APSI's work is to maintain the matrix that assesses university sustainability. Related to this matrix, the APSI also conducts annual evaluations of progress to be published in annual reports. A nearly immediate benefit of hiring the APSI was increased connection between students, faculty, staff, and local community organizations. In addition, part of the APSI's work involves preparing and delivering professional development and training programs on sustainability to students, staff, faculty, and members of community organizations.

These initiatives, which are the focus of our discussion, became well established and highly regarded almost immediately. Our analysis suggests that this rate of growth and campus enthusiasm were due to two critical ingredients. We had a clear message from the university administration that they were serious about sustainability efforts. Second, we had independent pockets of student and faculty collaboration on specific green initiatives that we could easily connect. These two ingredients allowed the University of Louisville to make major progress in its goal to authentically meet its urban mission.

## **Student-Led Campus and Community Research**

Many of the university's initiatives, including those ranging from student-based issues (e.g., campus living) to broad-scale administrative and physical planning (e.g., campus master plan, managing storm water), involve students in key ways. Further, several initiatives have begun and/or been propelled forward by student research.

## **Greening of Honors: Opportunity for Sustainability Research**

The roots of many of the student-led campus and community research projects resulted from an effort to pull together interests of existing faculty in sustainability. Faculty worked with the director of the University Honors Program on developing an organizational or themed structure for green courses within the Honors Program and, in fall 2006, the “greening of the Honors Program” began. Each fall semester several courses on sustainability topics are offered in the University Honors Program. For example, a seminar course on Integrated Marketing Communication Campaigns was taught through the lens of supporting people to make changes toward more healthy and sustainable living.

Each spring semester the courses offered provide opportunities for students to continue their exploration of sustainability and conduct research and community outreach projects on sustainability issues. For example, in one course, students developed small-scale demonstration projects to test some of their ideas about changing people’s attitudes about how difficult it would be to become “greener” in daily life. In addition, several of these Honors courses are now taught as regular disciplinary offerings, extending the focus throughout other areas of the university. The greening of the Honors Program led to a significant increase in awareness of and interest in sustainability issues on campus among students *and* faculty. Final presentations in these classes were open to people interested in issues of sustainability and it became part of the greening of honors tradition to have folks from other academic departments, operations and facilities, as well as community agencies attend the final class. U of L strives as part of its mission as a metropolitan university to connect its students to understanding and resolving community issues. In the University Honors Program, students have been able to translate their knowledge of sustainability and environmental issues to action in the community. Research topics have included aspects of health, culture, and engineering, and the popularity of these courses was very high from the first semester they were offered.

This “green Honors” focus has resulted in several lessons learned. First, these efforts have generated considerable student interest; thus, one lesson is that students are clearly interested in sustainability and willing to do research on topics that they care about and that have possibilities of making a real difference on their campuses and in their communities. Second, a number of existing faculty have interests as well and are already teaching related courses. Such faculty are “easy sells” to get involved in these efforts and enjoy teaching in areas with high student interest and commitment. Initiatives like Honors teaching or field trips often pique faculty interest because they allow flexibility and the opportunity to try out new course formats and research ideas.

## **Research Projects and Green Courses**

Since the introduction of sustainability courses that connect research to the community, a large number of research projects have been initiated by U of L students. For example, one group researched the environment and development of childhood asthma,

culminating in workshops delivered to Head Start parents; another worked to develop middle school readers focused on child health for Jefferson County Public Schools. Additional research projects have ranged from identifying and assessing barriers (e.g., social, economic, and environmental) to using health care at a community center for immigrants, to collecting used cooking oil from campus eateries and converting it to biodiesel for area shuttles. A large collection of faculty and students have developed a research group and meet monthly to share ideas on combating childhood obesity through healthy and mindful living. Below several specific types of projects are described: Behavioral Energy Audits, Social and Behavioral Change, Greening a Residence Hall, and Art and Sustainability. Each of these projects grew out of coursework and many have continued with new classes or through new funded research proposals.

### **Reducing Energy Use through Social and Cultural Means: Behavioral Energy Audits**

Students from one of the green Honors Program courses began working with several behavioral scientists on discovering how to reduce energy use through social and cultural means. This theme was an early and highly visible one for the entire campus and it was supported by the Climate Change Teach-In and Campus Sustainability Day celebrations. In this research project, processes to assess energy use in each faculty and staff office were developed and tested to complete a social and behavioral energy audit. Energy audits were conducted initially in each academic department of Arts and Sciences, supported by the Arts and Sciences Dean and the Green Team. Now the process is continuing to include administration buildings (including the President's Office!), the student union, and physical education and sports facilities. Components of the plan were developed based on current programs and have included education, assessment, and intervention (e.g., new light bulbs, stickers on light switches). Each audit also included recommendations and calculations of how much could be saved by taking certain actions. Each faculty and staff member received their own audit and the energy audits were also presented to each department chair. Students in Engineering and in Arts and Sciences conducted the research and now we have well-established protocols to identify the energy use of individual faculty and staff members and to identify ways that individuals can reduce their energy demands.

From these energy audits, several useful lessons can be gleaned. The key one is that, from one student-led project, momentum can begin and spread across campus. Mounting interest resulted from the work of these students and now it has caught on across many areas of the campus. As the span of these audits widens, we expect even more interest from staff, faculty, and other students. Another outcome from these audits was the ripple effect on faculty and departments. For example, as individual offices were audited, faculty became more aware of what they could do to change energy use. This awareness fueled conversations that resulted in some departments developing sustainability policies, focusing, for example, on what faculty, staff, and students could do to increase recycling and lessen waste and energy use.

## **Sustainability and Behavior Change**

Psychologists introduced the idea of a behavioral energy audit to students as a challenge and opportunity. Would people who were introduced to possible ways to change their behavior and practices in their offices just make those changes? Was education all that was needed to increase energy conservation? Students learned about the theory underlying behavior change and then worked on research proposals to support energy conservation. The research strategy of changing individuals' energy use followed an intervention model based on the Transtheoretical Model (Prochaska and Velicer 1997). The Transtheoretical Model (TTM) of behavior change, a process-oriented model, has been shown to be highly effective in modifying negative health behaviors (e.g., smoking, substance abuse, sedentary lifestyle). According to the TTM, behavior change occurs through a series of stages: Pre-contemplation, Contemplation, Preparation, Action, and Maintenance. Many population-based health problems involve individuals who are not aware of such problems, such as diet-related heart disease risk or environmentally-based cancer risks. Promoting awareness is thus critical in initiating a process of change to progressively move such individuals from Pre-contemplation (i.e., lack of awareness) to the Action and Maintenance stages. This issue produced additional research projects for students studying communication and they developed proposals for how different communications were needed, based on the target audience's stage (i.e., Pre-contemplation, Contemplation, Preparation, Action, and Maintenance) of behavior. Based on surveys and interviews, students found not only that individuals are at different stages of readiness for change, but also that larger entities—groups and departments—reacted differently to receiving information. Some departments quickly established new office procedures, set their own guidelines for recycling, got rid of small refrigerators and designated larger shared refrigerators, and so forth. These groups were clearly ready for action. The theoretical ideas regarding stages of thinking became alive for the students and for the entire campus. At the end of this course the research plans were presented to faculty, staff, and administrators and evaluated. These plans were then developed further by faculty and students and presented at a professional conference (Salmon, Barnett, and Benson 2009).

This set of projects was useful in illustrating to students the enmeshed nature of energy use, knowledge, and behavior. This research also involved multiple disciplines, demonstrating how complex issues are best understood by building on the knowledge sets generated from diverse perspectives. Lessons learned from this behavior change project include the synergy that can be created when undergraduate students, graduate students, and faculty come together to formulate plans to improve a situation and to extend that work into the community. An especially interesting and meaningful result from several such projects is that some students and faculty have continued to work on “class projects” well beyond the end of the semesters in which the classes were offered. For example, one student in a Communication course developed a Spanish-language website, populated with original news articles as well as translated news stories, for members of the Hispanic community. This website contained a variety of educational materials on reducing energy use and other sustainability-related topics as well as links to a number of community organizations. Working in collaboration with the community, the student kept the site active until his graduation. At present, his brother, a first-year

student, is engaged with the original course faculty in maintaining the site. Such ongoing commitment to sustainability efforts allows the faculty, students, and community members a foundation upon which to build future sustainability projects.

### **Artists and Architects Design a Green Residence Hall**

In Spring 2009, students in an art and architecture class learned about sustainable design and worked to design a demonstration green residence hall room. The goal of the research project was to identify ways that the quality of student life could be improved while reducing utility costs. Students learned about sustainability and ecosystems as part of the course and developed comprehensive plans to change residence hall living. New types of furniture and storage were proposed to increase communal space and multi-use space. For instance, loft style beds were proposed to provide new space below each bed for student desks and storage. Air quality and temperature improvements were to be achieved by adding a ceiling mounted variable speed fan, which increased residents' control over their room temperature. New bathroom fixtures to lessen water use were seen as critical to reducing resource use and utility costs. Given the nonstandard sleeping patterns for dorm residents and thus the need to control lighting in each room, new greener alternatives to window blinds were proposed, which also addressed heating and cooling issues.

At the end of the semester, students presented alternative proposals to university architects, facilities and management staff, and faculty interested in sustainability; the plans were fully evaluated. As of fall 2009, there is a pilot green residence hall room, which includes not only new types of living materials and light fixtures, bathroom fixtures, and so forth, but also educational materials about the goals of the project and the materials used to reduce resource use and utility costs, improve living space, and build connections to other sustainability initiatives at U of L. This one residence hall room is the result of student research in sustainability and it has prompted a new way of thinking about living and learning in a more sustainable way at U of L. The green residence hall has led to new research initiatives that are currently ongoing. Living in the residence hall at U of L is considered to be an extension of the social, educational, and community life at U of L. Collegiality and green awareness go hand-in-hand in supporting college students' first experience of living away from home. Further funds are being sought to support research that incorporates educational experiences into living experiences at U of L.

Key lessons from this student-designed model green dorm room center in students educating other students. Clearly, the students in the art and architecture course benefited from learning about and applying sustainable design principles. Their efforts resulted in a model green dorm room, which other students now benefit from living in and learning from. Additionally, the dorm room has been part of several campus tours, serving as an education tool for all who see it, and the students living in the room frequently give talks about their experiences, which spreads the word even further. This experience provides an example of how much can be accomplished from the research efforts of one class.

## **Sustainability and Art**

Learning about sustainability and communication led to projects in art as well as science. One of the student research projects coming out of an Honors communication class was the establishment of a Spring Art Exhibit on Sustainability. The name of the event was “Featuring a Greener Campus: Arts and Sciences Student Council Art Exhibit.” The event, hosted on Earth Day, was on campus, with free food and music. The event was held in the centrally located and easily accessible Student Activities Center and was widely attended. Pieces of artwork were entered into various categories, such as recycled media, photography, and acrylic, and exhibitions were judged and awards given. Beyond students learning about hosting and promoting an art fair, this event provided opportunities for students to exhibit their art and for this art to raise awareness.

This student-led project reinforced our knowledge that when given openings, students will be highly creative and ambitious in their goals. A course in the social sciences resulted in a humanities project—an outcome that further illustrates the integrated nature of education and of sustainability efforts. This project also reinforces the ways that student projects can draw together faculty, staff, and university initiatives and result in positive outcomes. Such lessons are key to building future endeavors. As this event expands in future years, additional goals include augmented publicity to further increase attendees from across campus as well as inviting more members of the community, especially the arts community, to attend and participate (e.g., as judges).

## **Engineering and Operations**

Across the past semesters, several students have worked on university operations-related research projects. These projects have included the following:

- Assessing storm water run-off
- Reviewing the use of the city’s “drainage fee” to fund storm water projects
- Taking soil surveys
- Mapping trees on Belknap, the university’s main campus, and estimating carbon sequestration
- Measuring computer energy usage to determine energy efficiency

The outcomes of these projects are influencing the campus in several ways. Several subsequent assessments will be based on these initial projects. In addition, in part due to these student projects, storm water issues will be included in the Belknap Master Plan. Due to exceptionally heavy rainfall in early August 2009, many buildings were flooded and the campus sustained an estimated \$15 million of damage, moving issues of water run-off to an increased level of urgency. Additional plans for porous concrete and rain gardens are underway. Also, based on student work and interest, action is being taken to improve campus bike safety and bike parking. Connected with these initiatives, student representatives from several groups (e.g., student government, registered student organizations) met and are working with metro government officials to improve bike safety in areas close to campus and on routes likely to be used in biking to the university.

Lessons learned from these student projects are many. First, students can be engaged and play key roles in needed campus and community changes. Their efforts can drive initiatives in crucial areas. The students involved in the projects above used their knowledge and training to assess campus issues; their results are being utilized by administrators and planners and will benefit future generations of students, staff, and faculty as well as members of the metropolitan community.

## **Benefits and Limitations**

Student-led research projects offer a number of benefits and are influenced by some limitations. The benefits include:

- Increased student engagement
- Closer faculty and student working relationships
- Deepened student knowledge and enriched experience
- Increased understanding of campus and community issues and problems
- Possibilities for students to engage in class, practicum, or thesis work that can make a real difference on their campus and in their community
- Opportunities for faculty to work with students in new ways
- Meshing of student, staff, and faculty relationships
- Opportunities for linking educational endeavors with university operations
- Building a better informed university community

Because issues of sustainability are ubiquitous, opportunities abound for students with diverse interests, majors, and skill sets to engage. In addition, the passion of today's university students for the environment and social and economic justice makes sustainability a powerful area with considerable traction for student-involved and student-led efforts.

Two central limitations are present—time and money. Certainly, with unlimited time and financial resources more work could be accomplished with more students. Although interest at our university has helped to offset such limitations, these factors have clearly shaped our progress to date. However, the university's overarching commitment to sustainability and allocation of funding to infuse sustainability into courses across the curriculum and engage students in these efforts has been crucial to progress. Further, the real and pressing nature of sustainability issues has wed administrative, faculty, and student interest and has galvanized commitment. In fact, student commitment has often counterbalanced the time limitation, encouraging more faculty and administrative buy-in. Additionally, continued research, fueled by initial expenditures, may spawn solutions needed to reduce overall costs as well as increase sustainability.

## **New Directions**

Several extensions of the work on campus and in the community to date are planned and will be useful in advancing the university's sustainability mission. In particular, efforts are underway to build a sustainability center on campus, to develop an

undergraduate interdisciplinary major focusing on urban sustainability, to expand the university's Green Threads program to infuse sustainability into courses across the curriculum, and to provide increased support for student research on sustainability. Below each of these initiatives is described.

### **U of L Center for Sustainability**

Our next step in building the U of L Center for Sustainability will be to acquire funds to hire a full-time director with the rank of Full Professor and Graduate faculty standing. The director would ideally be funded on a named "Endowed Chair for Sustainability" that would be matched with corporate funding. The expectation is that sustainability will be a hiring priority and as vacant lines are filled in various departments there is a priority placed on connecting to the sustainability center. The director will have four primary responsibilities: (1) Administrative oversight of the sustainability center; (2) Teaching in and organizing a new academic major in sustainability studies; (3) Stimulating research by helping to secure grant funding, serving on thesis and dissertation committees with an environmental emphasis, and encouraging interdisciplinary research among academic and institutional units within the university; and (4) Assisting with the development of university- and community-based programs to foster environmental awareness and change.

### **Urban Sustainability Major**

Future directions include the implementation of a new undergraduate interdisciplinary major in Sustainability. The Urban Sustainability major will be designed to study and improve understanding of urban sustainability systems, technologies, and philosophies. A key focus of the major will be an internship in which students will conduct research on community issues related to sustainability. The interdisciplinary program will prepare students to better utilize natural resources, energy, and human capital to improve our quality of life and the environment.

### **Green Threads**

As part of our goal to support faculty development and increase awareness of sustainability—a base from which sustainability can be infused into a variety of courses across disciplines and colleges—the university has devised Green Threads. This workshop-based faculty development program is based on the highly successful Ponderosa (Chase and Rowland 2004) and Piedmont (Barlett 2004) projects. Green Threads was implemented on our campus in spring 2009 and the first group of participants is teaching new or revised sustainability-related courses this academic year. During the current academic year, efforts are expanding to the second group of faculty participants and hopefully part-time lecturers and graduate students as well. Participation in these workshops involves stipends for course development and the possibility of small grants for curricular projects.

## **Supporting Research on Sustainability**

In order to further develop student research on sustainability the university must provide coordination and support for research on sustainability. One plan is to develop a research agenda for sustainability that will be disseminated to undergraduate, graduate, and doctoral students for consideration. A research fund will be established to provide support for undergraduate research projects as well as for graduate research. In addition, there is strong support for the development of research proposals for external funding in collaboration with the Office of Sponsored Programs. As evidenced by the description of the grant proposals described above to further support the behavioral energy audit and the green residence hall, faculty are encouraged to develop research projects, to be funded both internally and externally, that are thematically related to the environment and sustainability. The university is also interested in hosting a series of campus and community forums on sustainability, bringing national and international leaders, researchers, and authors to campus. Active participation in regional, national, and international campus sustainability conferences, workshops, and forums will increase the profile of U of L sustainability initiatives and increase student awareness and commitment to research applied to the community.

## **Conclusion**

The University of Louisville's sustainability logo says, "Green: It's Happening Here." And it is. The university is working to become one of the most sustainable universities in the country, and some indicators reflect its accomplishments. For example, in the Sustainable Endowments Institute's (SEI) annual report card, U of L has moved from a C+ to a B+, the highest rating of any public university in the state, in just two years. Additionally, the university has committed to participate in the first year of STARS scoring with the Association for the Advancement of Sustainability in Higher Education (AASHE). Our students are key leaders in these efforts. Working alongside faculty, staff, and administrators, they are sowing the seeds of a new tomorrow—a different future than the one predicted by current projections, one that is greener and more sustainable. Further, through the types of research efforts chronicled and described in this article, students educate not only themselves and others studying and working across campus, they educate future generations—making another tomorrow an even greater possibility.

In summary, at U of L, faculty, students, and staff are focused on integrating education and research about sustainability; that is, how to live and work in a greener, more sustainable world, into many aspects of campus operations and community relations, from purchasing policies to recycling programs, to courses and research projects. In the coming years U of L will become defined as a university that is "walking the talk" and a metropolitan university that is serious about sustainability and has undertaken intentional change—on the campus and in the community.

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