Fostering Sustainability in Higher Education: A Mixed-Methods Study of Transformative Leadership and Change Strategies

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As evidence of the earth's limited capacity to sustain human life mounts, institutions of higher education are being looked to for leadership in the effort to educate students about environmental concerns and support the development of sustainable innovations. Colleges and universities are responding to this call for leadership by starting and/or expanding environmental research programs, integrating sustainability issues throughout the curriculum, adopting sustainable operations, and building green facilities. Reflecting upon the sustainability efforts of these institutions, this research study explores the following questions:

What factors are essential for initiating and leading a successful change effort to foster sustainability in higher education?

What processes guide higher education institutions in efforts to deeply and comprehensively implement sustainable changes?

A sequential mixed-methods research design was used to gather data from questionnaires administered to 86 colleges and universities in the United States implementing sustainability programs and from interviews with 20 individuals who are guiding the change processes at ten different institutions. After the data had been analyzed to identify common themes, factors, and change-process strategies, the results of the analyses were examined in relationship to existing models of change in higher education. Significant correlations were found between the change strategies used and the support systems provided by these institutions and the level of progress achieved on the sustainability initiatives.

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In January 2003, the National Council for Science and the Environment (NCSE) released its *Recommendations for Education for a Sustainable and Secure Future* (2003), a document written to "shape the upcoming United Nations Decade of Education for Sustainable Development (2005–2015)." Believing that educational institutions are "uniquely positioned to help solve the challenges of environmental, social, and economic sustainability through innovations in teaching" (p. 5), the NCSE members urged schools to take the lead in becoming sustainable. Today, six years after the release of this report and four years into the Decade of Education for Sustainable Development, higher education institutions are responding to the call for leadership by starting and/or expanding environmental education programs, integrating sustainability issues throughout the curriculum, adopting sustainable operations, and building green facilities.

There is much to be learned from the colleges and universities that have begun to embark upon the path to sustainability. As more institutions adopt sustainable practices and document the results of their efforts, we are gaining a better understanding of how the sustainable college or university needs to function. Of particular interest to those attempting to implement sustainability initiatives is just how to lead this transformative change process purposefully and successfully in their institutions. The purpose of this research study was to learn about ways of fostering sustainability in colleges and universities by exploring answers to the following questions:

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Existing literature offers several organizational change models that may be relevant to the implementation of sustainability initiatives (Doppelt, 2003; Kotter, 1996). There is, however, some reluctance among sustainability leaders in higher education to apply an organization development model to their institutional change effort (Kezar, 2001; Marshall, 2007). Change management models may not be a good fit in the education sector for a number of reasons. Kezar (2001) describes higher education institutions as loosely coupled organizations with a unique culture of collegial, bureaucratic, political, and anarchical systems and values. These multiple power and authority structures create an ambiguous leadership structure, which makes an intentional change process more difficult.

The changes to be made by colleges and universities, which include curriculum as well as operations, are complex. Becoming sustainable involves a change process that reaches across the institution and systemically impacts the core of the organization and every department within it in a multitude of minor and profound ways. Every employee and student within the educational institution will be asked to change behaviors of purchasing, consumption, disposal, and transportation, at the very least. These behavior changes may require the questioning and modification of deeply held value systems about working and living. Sterling (cited in Corcoran and Wals, 2004) believes that reorienting higher education in the context of sustainability depends on "widespread and deep learning within the higher education community" and proposes a "systems-based model of learning" as a tool for "thinking about the difficulty and possibility of such deep change" (p. 49).

The concept of social change further complicates the issues of sustainability. Instructional disciplines within higher education inform and are also informed by the practices of the world outside the institution. At what point does the university become responsible for changing the world and just how is that social change to be effected? Scott and Gough (cited in Corcoran and Wals, 2004) suggest that social change cannot be "managed" as a "top down" initiative. Rather, the process of becoming sustainable calls for the engagement of all the impacted community members in social learning and the mutual development and implementation of solutions.

Given the sweeping and systemwide changes required of the higher education institutions that choose to become sustainable, these organizations appear to be embarking upon a transformational change process. Distinguishing transformation from other kinds of change, Eckel, Hill, and Green (1998) provide a definition of transformative change that seems very relevant:

> Transformation (1) alters the culture of the institution by changing underlying assumptions and overt institutional behaviors, processes, and structures; (2) is deep and pervasive, affecting the whole institution; (3) is intentional; and (4) occurs over time. (p. 5)

Clearly, deep, systemwide transformation of this magnitude is not a quick fix; it is a challenging and evolutionary process that requires skilled leadership, supportive internal and external conditions, involved constituents, critical resources, especially time and money, and a well-coordinated communication process. The factors of successful change efforts in higher education have generated much interest and been the subject of a number of research studies in the recent past (Brodie, 2007; Calder and Clugston, 2003; Eckel et al., 1999; Marshall, 2007; Shriberg, 2002). Factors identified in the literature as being related to successful transformative change processes in higher education are listed in Table 1.

Research Methodology

Research Design

The focus of this study was on the relationships among leadership strategies used to initiate, manage, and support sustainability initiatives in colleges and universities, the role and participation of constituents in the change process, characteristics of the institutions, and evidence of change itself. A sequential mixed-methods approach was used to study the factors and processes of this change effort. The design began with a descriptive/correlational phase followed by a qualitative phase. Data about the leadership of sustainability efforts, the strategies used to initiate and manage this change process, and the progress made on the sustainability initiatives were gathered from questionnaires administered in April 2008 to individuals in 86 colleges and universities in the United States (US) that have implemented sustainability initiatives. Follow-up interviews with 20 individuals at ten institutions who were

Table 1. Factors of successful change efforts in higher education

Factors of successful change efforts in higher education	Characteristics of the factors (based on themes identified in the literature)
Internal conditions	Solid infrastructure, sense of goodwill, and mutual trust (Eckel et al., 1999).
External environments	Exert some pressure, encourage change (Eckel et al., 1999). Source of support, advocacy, and funding (Stanton et al., 1999).
Leadership characteristics	Leaders perceived to be credible and have personality needed to promote the initiative (see Calder and Clugston, in Corcoran & Wals, 2004). Leaders display attitudes and use approaches that facilitate change (Eckel et al., 1999).
Change process	A long-term, planned, balanced approach is used. A sense of urgency and appropriate deadlines exist. Investments of funding, time, and training are made (Eckel et al., 1999). Incremental changes are emphasized (Stanton et al., 1999). Sufficient publicity exists to generate awareness of the program's progress, successes, and failures (Calder and Clugston, 2003).
Engagement of constituents	Leaders involve and listen to the institution's constituents (Eckel et al., 1999).
Facilitated learning	New ideas are invited. Ongoing and widespread conversations are fostered. Actions are adjusted in response to learning (Eckel et al., 1999). Debate is encouraged as community seeks best principles, practices, and outcomes (Stanton et al., 1999).
Change characteristics	Academically legitimate, grounded in recognized body of knowledge, documented academic rigor and validity (Stanton et al., 1999). Endorsed by key administrative leaders at the institution. Perceived to benefit many programs and departments. Fit with institution's ethos, saga, and/or culture. Bring in critical resources and/or produce cost savings (Calder and Clugston, 2003).

instrumental in initiating and guiding the change processes at their institutions contributed to the data. Table 2 summarizes the factors included in the questionnaire items.

The quantitative data analysis included measures of central tendency and variability such as means, variances, and ranges, which were calculated, plotted, and graphed in the SPSS (Statistical Package for the Social Sciences) system. These scores provided information about the characteristics of the institutions responding to the questionnaire and details regarding the sustainability initiatives and the implementation process. Performing correlation and regression analyses of the change results and a variety of institutional and strategic factors assisted in the identification of relationships between the change experiences of these colleges and universities and potential theories and models of change in higher education. Using the degree of progress made on sustainability initiatives as the dependent variable, regression equations were calculated for significantly related characteristics and factors as independent variables. The information that emerged from the quantitative analysis was used to identify the institutions selected to participate in the follow-up interviews and also suggested themes to explore during the interviews.

The purpose of the qualitative phase of the study was to gain an understanding of the sustainability change process from the participants' perspective, especially in light of the factors that appeared to be related to their change efforts. Interview questions focused on the experiences of these institutions as they sought to implement sustainability initiatives and provided detailed descriptions of their process, approach, and experiences. The interviews were transcribed, coded and analyzed for content and themes (Strauss and Corbin, 1998), and then integrated with the quantitative data for the final analysis.

Participant Selection

Participants were recruited from approximately 330 higher education institutions within the United States interested in or engaged in the implementation of sustainability initiatives. The institutional participants came from the membership list of the Association for Advancement of

Table 2. Factors included in questionnaire items

Factors included in questionnaire items	Factor descriptors
Characteristics of college/university	Size, degrees offered, public/private funding, location.
Internal conditions	Institutional culture: collegial relations, trust/respect, openness to learning.
External environments	External constituents as a source of pressure or support.
Leadership characteristics	Perception of sustainability initiative leaders: credibility, personality/attitude, facilitation, and change-management skills.
Change process	Existence of a plan. Clear and achievable goals. Appropriate deadlines. Investments of funding, time, and training. Sufficient communication regarding program's progress, successes, and failures.
Engagement of constituents	Constituent involvement. Process for communicating meaningfully with constituents.
Institutional learning	New ideas and approaches were encouraged. Actions and plans were adjusted in response to learning.
Change characteristics	Supported by key administrative leaders. Benefited many programs and departments.
Degree of changes made	Number of changes. Variety of changes. Breadth of changes across institution. Depth of changes.
Barriers to change	Barriers encountered. Barriers overcome. Strategies used to overcome barriers.

Sustainability in Higher Education (AASHE), a member organization of colleges and universities working to advance sustainability in higher education. Of the 330 institutions invited to complete the questionnaire, 86 responded.

The ten institutions to be interviewed were selected after the questionnaire data had been collected and analyzed. In determining which colleges and universities were to be interviewed, the questionnaire responses were summarized and sorted by a variety of filters to identify exemplary characteristics, such as sustainability initiatives completed, leadership characteristics, support or resistance factors, and change-process supports. Colleges and universities that reported very high or very low levels in at least three of these characteristics were selected as interviewees. The ten interviewees represented a well-dispersed range of college and university characteristics such as institution size, type, and location. The first interviewee at each institution was the contact person listed on AASHE's membership list. Once the first interview was conducted, a snowball selection process was then used to identify one or two other individuals at each institution to be interviewed.

Results and Discussion

Based on the themes identified in the literature, specific research questions were developed that informed the design of the research study and research instruments and will also provide a structure for the discussion of the findings of this research study.

Question 1: Which Colleges and Universities in the United States Have Initiated Sustainability Efforts and What Are the Characteristics of These Institutions?

Institutions selected to participate in the research study were AASHE members. These institutions shared at least two common characteristics: they were working on becoming sustainable and had chosen to belong to an association

of colleges and universities that support organizations for this purpose. Questionnaire responders came from a variety of colleges and universities, including a wide range of institution sizes, as measured by the number of students and the number of employees, every Carnegie classification, both privately and publicly funded institutions, those located in urban, suburban, rural, and multiple community settings, and institutions from around the country. There were no significant correlations between the characteristics of these respondent institutions and progress made on the sustainability initiatives.

Question 2: How Did These Institutions Initiate the Change Process?

The development of a sustainability plan emerged as an important theme to those leading the sustainability initiative. This theme is supported in the literature, as well (Eckel et al., 1999). The colleges and universities responding to the questionnaire were at varying stages of progress on their written plans. Less than half (48%) had completed a written plan. Results of the correlation analysis and the regression analysis suggest a significant relationship between the completion of a written plan and the progress made on the sustainability initiatives. The importance of a written plan was also emphasized in the interviews. All of the interviewees that had achieved a high level of progress had completed a written plan.

The quality of the written plans was also correlated with the progress achieved on the sustainability initiatives. High-quality plans had a number of characteristics. The plans were written documents formally adopted by the college/university and communicated to the entire campus. These plans identified the roles and responsibilities of participants, included goals, tasks, and a time line, and provided a measurement or feedback process to assess goal completion.

Question 3: What Sustainability Initiatives Have These Institutions Chosen to Work On and What Have They Accomplished?

Questionnaire items were designed to determine what sustainability goals the respondents were working on and how much progress they had made on those goals. Goals were organized within seven different areas: sustainability curricula; student engagement in sustainability initiatives; sustainability research; sustainable campus operations; sustainable energy; sustainable transportation; and the investment of endowment and/or foundation monies in sustainable investment funds. The evaluation of progress on the sustainability initiative included a measure of the number of goals the institution was making progress on, as well as the degree of progress, from "no progress" to "goal completed," the institution had achieved on each goal.

The data suggest that colleges and universities are working on a wide range of sustainability initiatives and are making progress on these initiatives. Progress on each goal area is summarized in Table 3.

- *Student engagement goals*. The mean progress rating for this goal area was 3.4 on a scale of 0–5. Nearly 35% of the questionnaire respondents indicated that they had achieved their student engagement goals, the highest completion rating of all the goal areas.
- *Operations goals*. The mean progress rating for this goal area was 3.2. Of the respondents, 93% reported that they had made progress on their goals in this area, whereas

Table 3. Summary of progress made on sustainability goal areas

Sustainability goals	Not a goal	No progress	Some progress	Progress	Significant progress	Goal completed	Mean progress rating
Scale	**0**	**1**	**2**	**3**	**4**	**5**	
	Percent	**Percent**	**Percent**	**Percent**	**Percent**	**Percent**	**Mean**
All student engagement goals	6.5	2.9	21.8	13.8	20.3	34.7	**3.4**
All sustainable operations goals	1.2	4.9	22.3	25.2	34.4	12.0	**3.2**
All sustainability curricula goals	15.7	12.4	23.5	18.1	10.3	19.9	**2.6**
All sustainable energy goals	11.5	18.4	19.3	16.9	26.4	7.4	**2.5**
All sustainability research goals	0.0	42.2	17.5	13.1	13.4	13.8	**2.4**
All sustainable transportation goals	11.9	23.1	25.3	13.4	16.9	9.4	**2.3**
Investment in sustainable funds	59.0	18.1	10.8	6.0	3.6	2.4	**0.8**

12% said they had completed their goals. Only 1% of the respondents did not have goals in the area of sustainable operations.

- *Curricula goals*. The mean progress rating for this goal area was 2.6. Nearly 20% reported that they had achieved their goals in this area. On the other hand, more than 15% indicated that curricula goals were not included in their sustainability initiatives, and another 12% said they had made no progress on their goals.
- *Energy goals*. The mean progress rating for this goal area was 2.5. However, the completion rate of 7% for this goal area was one of the lowest of all the goal areas. Energy was not a goal area for 11% of the respondents, and 18% indicated that they had made no progress on their goals in this area.
- *Research goals*. The mean progress rating for this goal area was 2.4. This was the only goal area in which all respondents indicated they had goals. Although 42% reported no progress on their research goals, nearly 14% said they had completed their goals in this area.
- *Transportation goals*. This goal area had one of the lowest mean progress scores: 2.3. More than 23% said they had not made any progress on their goals, and 12% said they had not included goals from this area in their initiatives. Despite this, 9% reported that they had completed their transportation goals.
- *Investment goals*. This goal area had the lowest mean progress score: 0.8. Of the respondents, 59% indicated that they did not have goals in this area, and another 18% said they had made no progress on their investment goals.

Comments gathered from the questionnaire and the interviews provided insights into the diverse range of goals being explored and implemented, confirming that colleges and universities are working on a wide variety of unique, creative projects for exploring sustainability issues and technologies. From sustainability degrees, classes, and programs to improved lighting systems and composting to the generation of carbon-free, alternative energy, higher education is proving itself to be a source of sustainable solutions.

Question 4: Who Was Involved in the Change Effort and How Did These Constituents Work Together?

As reported in the questionnaire responses, sustainability initiatives at the 86 colleges and universities participating in this study were started by nearly every constituent group imaginable. Faculty members, both full-time and part-time, were catalysts for the change process in more than half of the institutions. Students led the sustainability effort at 35% of the colleges and universities, followed by presidents and then facilities and operations administrators. Often, a group of different constituents came together and supported one another in getting the initiative started.

It did not appear to matter which constituent group started the initiative. There were no significant correlations between the initiators of the sustainability effort and the degree of progress made on the initiatives. This is consistent with the findings of Barlett and Chase (2004). What appeared to be more significant to the success of this initiative was who became involved in the effort as it evolved and matured. Again, this is supported in the literature (Doppelt, 2003; Eckel et al., 1999; Kotter, 1996). Interviewees mentioned the importance of building a broad base of support that included facilities personnel, faculty, students, and top administrators (preferably, the college/university president).

Participants in this study reported differing roles and levels of engagement of the constituents involved with their sustainability initiative. Faculty, presidents, and students were most often identified as initiators and supporters of the effort. Facilities and operations personnel ranked high as supporters. Finance administrators were also included in the list of supporters by more than half of the questionnaire respondents. The formation of "deep, wide and powerful sustainability teams" (Doppelt, 2003) is a critical stage in building the broad base of support and engagement needed by this pervasive initiative. To accomplish the systemwide transformative change process required by sustainability, the initiative needed to be endorsed by key administrative leaders at the institution and perceived as benefiting many programs and departments (see Calder and Clugston, cited in Corcoran and Wals, 2004).

Few institutions reported a significant number of resisters. Many questionnaire respondents explained that they were facing indifference more than resistance. However, when resisters were identified, finance administrators were the group most often selected, followed by students, faculty, and facilities personnel, respectively. Although the existence of resisters did not have a significant measurable relationship to progress made on the initiatives, as described in the interviews, their impact could profoundly limit the success of the initiative. Several of the interviewees described difficult situations they had to cope with as they attempted to work with resisters. A change effort that

depends on the motivation and passion of the change agents can be derailed by resisters with powerful positions in high levels of the institution.

The role of external community members, as reported by the questionnaire participants, was limited. Community agencies and community residents were identified as supporters by approximately 25% of the respondents. According to the literature, community members can be a source of support, advocacy, and funding (Stanton et al., 1999) and exert pressure for or encourage change (Eckel et al., 1999). Based on the questionnaire responses and interviewee comments, when community members were involved, their contribution to the success of the initiative was notable. Respondents received resources from their community members, such as grants, consulting expertise, and even equipment or supplies. Community members provided sustainable products like organic or locally grown food and pilot-tested new sustainable technologies. Community employers hired program graduates. Government agencies established sustainability mandates and provided grants and/or consultants. Sustainability associations, like AASHE, offered network support systems such as professional development and sustainability rating systems.

The current leadership structure of the sustainability initiatives varied at the different colleges and universities. More than half of the respondents had established an office of sustainability, whereas the initiative was still being managed by an informal group at almost 20% of the institutions. Of the respondents, 98% had groups of individuals serving on a sustainability council, committee, or task force. These groups ranged in size from 2 to 20, with nearly 40% of the respondents reporting that their groups had 11–20 group members.

While neither the correlation nor the regression analyses identified significant relationships between the group size or structure and progress on the initiatives, the importance of this theme to the study participants was emphasized in the interviews. Several of the colleges and universities on the threshold of institutionalizing their sustainability initiatives were strategizing ways to move their leadership groups from informal collections of interested colleagues to formally recognized councils or committees with decision-making authority in their institutions. Moreover, a number of interviewees were developing budget proposals that would allow them to hire a sustainability coordinator or director. An emerging theme among the interviewees was the conclusion that their institution needed a sustainability council (or committee) and a sustainability director (or coordinator). The role of the council, which consisted of representatives from departments across the institution, was to build engagement, foster collaboration, and provide leadership. The sustainability director's role was to manage the sustainability projects.

Question 5: Which Institutions Have Made Significant and Lasting Sustainable Changes and What Factors Were Related to the Success of the Initiative?

The research design included a series of correlation analyses and a regression analysis for the purpose of identifying potential relationships between the progress the institutions had made on their sustainability initiatives and a variety of institutional characteristics, leadership qualities, and change strategies.

Correlation analyses

Results of the correlation analyses identified relationships between high levels of progress on sustainability goals and a range of change strategies and leadership characteristics. Table 4 summarizes the most significant factors related to successful sustainability initiatives of the colleges and universities participating in this research study.

The factors identified as being significantly related to high levels of progress on sustainability initiatives include a written sustainability plan, a skilled leadership group, a large and broad base of supporters, and a strong system of institutional supports. This list of factors, as a whole, is consistent with the factors of successful change efforts in higher education identified by Eckel et al. (1999) and by Calder and Clugston (cited in Corcoran and Wals, 2004). (See Table 1.)

The institutions participating in the interviews provided poignant examples of the conditions and situations that lead to failure. Without a well-thought-out plan, energy is diffused and resources do not get allocated to the sustainability initiative. A leadership group that is not inclusive of constituents from across the college limits engagement and opportunities for collaboration, resulting in an initiative that gets stuck at the department level. An unsupported sustainability initiative has a short shelf life. Some success may be achieved but without funding, buy-in from top administrators, and communication support, the volunteers who invest their time and energy to champion the initiative are apt to burn out.

Table 4. Factors significantly related to successful sustainability initiatives

Factors significantly related to successful sustainability initiatives	Characteristics of the factors
Development of a sustainability plan	The plan is a written document.
	Is formally adopted.
	Includes goals, tasks, and time lines.
	Provides a measurement and feedback process to assess goal completion.
Formation of a skilled leadership group	Has expertise in the issues and methods of sustainability.
	Gains participation from administrative and/or operational employees.
	Fosters collaboration between instructional and operational divisions.
	Provides frequent information about the sustainability initiative and the progress being made.
	Shares lessons learned from the results of the sustainability initiatives.
Large and broad base of supporters	Includes and engages members from as many constituent groups as possible, especially instructional administrators, student services, board members and students.
Strong and varied system of institutional supports for the sustainability initiatives	A sustainability coordinator or director.
	Funding for sustainability research and projects.
	Frequent public statements from high-level leaders in support of the sustainability initiatives.
	Ongoing support from an association of campuses working toward sustainability.

Regression analysis

A regression analysis was performed using SPSS to determine the extent to which the dependent variable—progress on the sustainability initiatives—was explained by institutional characteristics, institutional change strategies, and leadership approaches. Variables that were potentially related to the dependent variable were identified through a review of correlations and relevant ANOVA (analysis of variance) runs. The independent variables selected for inclusion in the regression analysis were *total support system*, *total plan quality*, *collaboration with departments*, *frequency of communication*, *Carnegie classification*, and two barriers, the *lack of time* and the *lack of money*. An initial regression analysis was run that included all seven of these variables. Two of these variables—frequency of communication and Carnegie classification—were not statistically significant in the regression model. The final regression model included five independent variables that were statistically significant. As shown in Table 5, the combined factors resulting in a correlation coefficient (R^2) of 0.547 include total support system, total plan quality, collaboration with departments, lack of time, and lack of money. Approximately 55% of the variance in measured progress on sustainability initiatives of the participating campuses was explained by the combination of these variables.

Table 6 lists the coefficients of the factors included in the SPSS regression model. As can be seen from the table, all variables had a significance level of less than 0.05.

Table 5. Model summary of variables related to progress on sustainability initiative

	R	R^2	Adjusted R^2	Standard error of the estimate	
Model	0.740	0.547	0.515	16.455	
	Sum of squares	***df***	**Mean square**	***F***	**Sig.**
Regression	22890.757	5	4578.151	16.907	0.000
Residual	18954.441	70	270.778		
Total	41845.197	75			

Dependent variable: goal progress points.
Predictors: support system total, collaboration with departments, plan quality total, lack of time, lack of money.

Of the variables identified as barriers—lack of time and lack of money—one of them, lack of money, had a negative relationship with the dependent variable. In other words, higher ratings of the lack of money as a barrier were related to lower ratings of progress on initiatives.

Question 6: What Barriers Were Encountered? Were These Barriers Overcome, and If So, How?

The research study participants were given opportunities in both the questionnaire and in the interview to discuss the barriers to sustainability initiatives they were dealing with. In the questionnaire, respondents were provided with the following list of barriers and were asked to rate each on

Table 6. Coefficients of model factors related to progress on sustainability initiatives

	Unstandardized coefficients		Standardized coefficients		
Model factors	***B***	**SE**	***β***	***t***	**Sig.**
(Constant)	10.904	12.106		0.901	0.371
Support system total	5.379	1.075	0.450	5.002	0.000
Collaboration with departments	8.147	2.531	0.310	3.219	0.002
Plan quality total	0.542	.241	0.229	2.248	0.028
Lack of time	4.837	2.171	0.256	2.228	0.029
Lack of money	−4.935	2.279	−0.239	−2.166	0.034

Dependent variable: goal progress points. SE, standard error.

a scale from 1 to 5, where 1 is "not a barrier at all" and 5 is "a significant barrier":

- Lack of leadership
- Lack of technical expertise
- Lack of interest
- Lack of hope
- Lack of time
- Lack of financial resources

Questionnaire respondents identified the lack of financial resources as the most significant barrier, closely followed by the lack of time. These two barriers were confirmed in the interviews and also showed up as predicting factors in the regression analysis. As explained earlier, the lack of money had a negative relationship to progress on the initiatives. High ratings of the lack of money as a barrier were related to low ratings of progress on the initiatives. However, high ratings of the lack of time as a barrier were actually related to high ratings of progress on the initiatives.

Overcoming these barriers requires specific and strategic supports from the institutions. When asked which strategies worked best for their institutions, questionnaire respondents most often chose "support from the college/university president." Their other top choices were governmental mandates and grants. Strategies for overcoming barriers that were significantly correlated with progress on sustainability initiatives represent a broader range of strategies:

- Support from the college/university president
- Professional development opportunities
- On-campus training programs
- Awareness-raising events and campaigns

Interviewees offered some practical advice for overcoming barriers. Being focused and strategic when selecting initiatives in the beginning is important. As one facilities director pointed out, "Pick an effort that can be sustained; an effort that will change behavior." His opinion is shared by a college president who has found "it doesn't take that much to make a difference. Little things add up."

Several of the interviewees emphasized the need to work with others. As a faculty member explained, "It all comes down to people, so get to know each other and build relationships." A sustainability director offered suggestions for dealing with those who are not eager to become engaged in the initiatives: "If people are resistant, you need to have patience and persistence. Listen to their issues. Keep bringing the subject up. You need to present information in several different ways until you wear them down."

Limitations and Future Directions

In this research design, respondents were asked to evaluate the progress they had made on the sustainability goals of their own institutions by using a questionnaire designed specifically for this research study. Although the AASHE staff provided assistance in the development of the questions used to assess the progress achieved on the sustainability initiatives, this self-evaluation process was subjective and may have resulted in biased responses. Respondents may have understated or overstated the progress achieved on their sustainability initiatives. This under- or overstatement may have been intentional or may have occurred because the respondents lacked technical expertise, complete information, or objectivity about their institution's sustainability initiative in comparison to others. AASHE recently completed the Sustainability Tracking and Rating

Table 7. Recommended strategies for fostering sustainability in higher education

Recommended strategies for fostering sustainability in higher education	Suggested methods for implementing strategies
Obtain backing of the college/university president's office as a champion of the initiative.	Identify sustainability as a priority in president's statement of institutional direction. Have the president take an active role in modeling and promoting sustainable behavior.
Institutionalize the sustainability initiative.	Make sustainability visible in the institution's mission and policy implementation. Establish an office of sustainability. Hire a full-time sustainability coordinator or director who understands both the operational side of campus sustainability as well as the institution as a teaching tool for research and student learning. Strengthen the governance structure by creating a sustainability advisory and/or oversight committee. Empower the sustainability committee with the authority to make decisions and the power to enforce them. Use centralized controls, e.g., stipulating products and energy-conservation steps.
Develop, formally adopt, and implement a sustainability plan.	Go through a campuswide process of writing the plan. Set specific goals with measurement and feedback processes. Issue mandates to meet the goals.
Allocate resources necessary to achieve the plan.	Provide financial support to sustainability projects. Secure grants and other sources of funding. Create an annual budget for the program. Make investments transparent and responsible. Provide additional staff resources to support the work of the initiatives. Offer guidance and support to staff participating in projects. Provide additional support in the form of external consulting, professional development, and training, as needed.
Foster greater and more active participation of the faculty in promoting sustainable efforts.	Expand the sustainability initiative into the curriculum. Provide incentives for faculty members to adapt their courses, or develop new courses, addressing sustainability issues. Provide release time for faculty to conduct peer-to-peer education on sustainability curriculum development.
Build a strong student commitment.	Develop programs to better inform and organize students. Include student voice in planning and decision making. Learn how to bring in students from different backgrounds and with different interests.
Engage more people; try to get everyone to be part of a continuing effort.	Establish a goal of greater campus awareness about the initiative from every demographic, including students, faculty, administrators, and staff. Support a coordinated communication effort by using a variety of communications media. Enhance our commitment by sharing the findings of our efforts with the public. Continue to educate and raise awareness both at the campus level and in the community. Communicate successes more clearly to the entire community.
Stay the course Pick up the pace!	Maintain the forward movement and the enthusiasm into the future.

System (STARS), which is a self-reporting assessment framework used by colleges and universities to measure progress on sustainability initiatives. One of the purposes of STARS is to establish a common standard of measurement for sustainability in higher education. It is anticipated that the rating system will support objective, comprehensive, and comparable assessment of institutional progress on sustainability initiatives. Future research studies may be

enhanced by using the STARS system results as the *dependent variable*.

Conclusion

The concluding note to this research study shares the lessons learned by the participants as they have reflected upon and sought ways of improving their own practices as sustainability change agents. The questionnaire closed with an open-response question asking the respondents to identify what their institutions could do better in their efforts to foster sustainability. Most of the respondents provided comments. By combining all their suggestions, a comprehensive collection of best practices emerged. Table 7 summarizes the list of recommended strategies and suggests methods for implementing the strategies.

This comprehensive list of lessons learned offered up by the questionnaire respondents eloquently summarizes the key themes that were addressed in this study and provides valuable words of advice to those who seek to foster sustainability initiatives at their own institutions of higher education.

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References

Association for the Advancement of Sustainability in Higher Education (AASHE). http://www.aashe.org/about/about.phprg (accessed February 1, 2008) and http://www.aashe.org/stars/index.php (accessed September 28, 2009).

Barlett, P., and G. Chase, eds. 2004 *Sustainability on Campus: Stories and Strategies for Change*. MIT Press, Cambridge, MA, 337 pp.

Brodie, A. 2007. *Environmental Sustainability Programs in Higher Education: Policies, Practices and Curriculum Strategies* (unpublished PhD dissertation). Bernard School of Education, University of the Pacific, Stockton, CA, 302 pp. Available at ProQuest Information and Learning Company, Ann Arbor, MI, UMI no. 3244681.

Calder, W., and R. Clugston. 2003. Progress toward Sustainability in Higher Education. *Environmental Law Review, News and Analysis* 33:10003–10023.

Corcoran, P., and A. Wals, eds. 2004. *Higher Education and the Challenge of Sustainability: Problematics, Promise, and Practice*. Kluwer Academic, Dordrecht, The Netherlands, 376 pp.

Doppelt, B. 2003. *Leading Change toward Sustainability: A Change-Management Guide for Business, Government and Civil Society*. Greenleaf, Sheffield, UK, 260 pp.

Eckel, P., B. Hill, and M. Green. 1998. *On Change: En Route to Transformation*. Occasional Paper Series of the ACE Project on Leadership and Institutional Transformation. American Council on Education, Washington, DC, 19 pp.

Eckel, P., B. Hill, M. Green, and B. Mallon. 1999. *On Change III, Taking Charge of Change: A Primer for Colleges and Universities*. Occasional Paper Series of the ACE Project on Leadership and Institutional Transformation. American Council on Education, Washington, DC, 65 pp.

Kezar, A. 2001. *Understanding and Facilitating Organizational Change in the 21st Century: Recent Research and Conceptualizations*. ASHE-ERIC Higher Education Report 28(4). Jossey-Bass, San Francisco, 162 pp.

Kotter, J. 1996. *Leading Change*. Harvard Business School Press, Boston, 187 pp.

Marshall, S., ed. 2007. *Strategic Leadership of Change in Higher Education: What's New?* Routledge, New York, 193 pp.

National Council for Science and the Environment (NCSE). 2003. *Recommendation for Education for a Sustainable and Secure Future: A Report of the Third National Conference on Science, Policy and the Environment*. NCSE, Washington, DC, 87 pp. Available at http://www.cnie.org/NCSEconference/2003conference/2003report.pdf.

Shriberg, M. 2002. *Sustainability in U.S. Higher Education: Organizational Factors Influencing Campus Environmental Performance and Leadership* (unpublished PhD dissertation). University of Michigan, Ann Arbor, 335 pp. Available at ProQuest Information and Learning Company, Ann Arbor, MI, UMI no. 3058044.

Stanton, T.K., D.E. Giles Jr., and N.I. Cruz. 1999. *Service-Learning: A Movement's Pioneers Reflect on Its Origins, Practice, and Future*. Jossey-Bass, San Francisco, CA, 272 pp.

Strauss, A., and J. Corbin. 1998. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, 2nd edition. Sage, Thousand Oaks, CA, 336 pp.

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