

Using a class to conduct a carbon inventory

A case study with practical results at Macalester College

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Abstract

Purpose – The purpose of this paper is to discuss the practical realities of using a college seminar to fulfill the carbon audit requirement for signatories to the American College and University Presidents Climate Commitment (ACUPCC) and presents evidence of this approach's advantages as an educational and practical tool.

Design/methodology/approach – The paper reviews the course structure and presents research findings, based on student questionnaires on student learning outcomes.

Findings – Structuring a course around a campus carbon audit has unique educational advantages for students and practical advantages for ACUPCC signatory campuses.

Originality/value – This paper enumerates the concrete advantages to using a college class to conduct a greenhouse gas emissions inventory and provides evidence of valuable learning outcomes for students in such a class.

Keywords United States of America, Higher education, Global warming, Carbon, Auditing, Sustainability planning

Paper type Case study

I. Introduction and overview

Climate change will affect everyone, and today's college students, no matter what their field of study, will have to confront its effects. Since the first known campus environmental audit – of UCLA by a group of students in 1988 (Creighton, 1998) – academic researchers working on campus sustainability issues have:

- linked the university environment and sustainable development (Clugston and Calder, 1999; Cortese and McDonough, 2001; Orr, 1991, 1994; van Weenen, 2000);
- examined the financial incentives for reducing campus environmental impacts (National Wildlife Federation, 1998); and
- documented successful campus sustainability initiatives (Creighton, 1998; Keniry, 1995).



An increasing number of colleges and universities have also adopted a range of environmental and sustainability policies that affect their physical operations. Over 350 college presidents in over 40 countries, for example, have signed the Talloires Declaration, the first document pledging the importance of sustainability to higher education (www.ulsf.org/programs_talloires.html) (Clugston and Calder, 1999). In addition, academic journals such as the *International Journal of Sustainability in Higher Education* and *Sustainability: The Journal of Record* publish a range of articles on campus sustainability that bridge the academic and the practical.

Within the last decade, reducing greenhouse gas emissions has become an important part of campus sustainability efforts. Tufts University developed the Tufts Climate Initiative in 1999 and committed itself to abiding by the Kyoto Protocol (Rappaport and Creighton, 2007). In 2003, Lewis and Clark College became the first school in the USA to meet Kyoto's provisions by reducing its greenhouse gas emissions to 7 percent below its 1990 emissions levels (www.lclark.edu/cgi-bin/shownews.cgi?1067204040.1). Bates College agreed to purchase all of its electricity from green sources in Maine. Middlebury College committed to climate neutrality by 2016. Campuses in the University of Wisconsin system, including Green Bay, Oshkosh, River Falls and Stevens Point, committed to energy independence by 2012 (Eagan *et al.*, 2008). In addition, students voted to raise their own student fees to pay for green power at numerous schools including the University of Colorado, University of Tennessee, and Augsburg College (Eagan *et al.*, 2008).

The most coordinated and far-reaching of the climate change actions taken by colleges and universities has grown out of the American College and University Presidents Climate Commitment (ACUPCC). Over 600 college and university presidents have signed the commitment as of this writing, which requires institutions to become climate neutral (that is, to emit no net greenhouse gas emissions or offset any emissions that they cannot eliminate). Signatories must develop an implementation plan with targets and timetables, integrate sustainability and climate change into the curriculum, and make their plans and greenhouse gas inventories publicly available (ACUPCC – www.presidentsclimatecommitment.org).

Macalester College President Brian Rosenberg signed the ACUPCC in 2007. As a signatory school, the college must develop a climate action plan with targets and timetables to become climate neutral. The first part of the commitment is to conduct a greenhouse gas emissions inventory, also known as a campus carbon audit. Developing a comprehensive audit back to 1990 is a complicated and research-intensive project that is both relevant and practical, making it perfect for a class research project. At Macalester College, all environmental studies majors take a project-based senior seminar. In the spring of 2008, 15 students in the environmental studies senior seminar conducted the institution's first greenhouse gas emissions inventory. This inventory, which students completed in May 2008, provides the baseline data that the college needs to proceed with its plans to become climate neutral.

This paper discusses the practical realities of using a college seminar to conduct a greenhouse gas emissions inventory, and presents evidence of the advantage of this approach as an educational and practical tool.

II. Macalester College

Macalester College is a small liberal arts college located in St Paul, Minnesota. The college enrolls nearly 1,900 students, and employs 170 faculty and 350 staff.

Founded in 1874, the school now includes 1.2 million square feet of building on 53 urban acres. During the Spring of 2008, when the course described here was taught, the Department of Environmental Studies had 48 declared majors and 2.93 full-time equivalent faculty. The school hired its first sustainability manager, who co-taught the environmental studies senior seminar described here, in January 2008.

III. Course goals, motives, and achievements

This course simultaneously fulfilled three broad goals. First, it allowed the college to meet the ACUPCC's campus carbon audit requirement in a thorough and timely fashion. Notably, it achieved this result without putting the college through the costly and protracted experience of working with an outside consulting firm, without relying on a student intern to do the work, and without requiring overtaxed faculty and staff to conduct the audit. Moreover, because a group of motivated students with relevant training performed the data collection, analysis, and interpretation over an entire semester, the results were more thorough and accurate than they might have been with another approach.

Second, turning the carbon audit into a course created a unique educational experience. Since the course required students to develop teamwork, solve tangible problems, and draw on a wide range of interdisciplinary knowledge, wrestling with the audit's various problems required students to integrate classroom theory with real-world practice. Like other courses that treat the campus as a classroom, students learned about a wide range of environmental problems associated with typical college operations, gaining a new appreciation of the school's bureaucratic structure, administrative practices, physical operations, and environmental priorities. Students also saw first-hand the utility of collecting accurate and reliable data for effective problem-solving.

Third and finally, the carbon audit will be a vital reference point as the college begins to develop its strategies for achieving climate neutrality. Students knew their work was an important step toward achieving broader campus sustainability goals, and that these goals had buy-in from the college president, which motivated them to produce a thorough, accurate, and informative audit. In addition, similar classes built around auditing campus carbon emissions have the potential to advance efforts to "green the campus," even on campuses that are not ACUPCC signatories. Faculty members who are interested in convincing skeptical administrators of the importance of campus greenhouse gas emissions, for example, could use an audit to highlight institutional strengths and weaknesses. As growing numbers of ACUPCC signatory schools begin to release their carbon audits, comparisons among similar institutions will be increasingly easy to make. Knowing how one's campus compares to others may give administrators a motive to develop carbon-reduction policies.

IV. Course structure

Before finalizing the class structure, the two course instructors (Wells and Hansen) met with various key players on campus to explain the project, its requirements, and the information students would be requesting. Meeting with Facilities Services was particularly fruitful. The director was eager to advance the project and assigned a single contact person in the department for students to approach with facilities-related questions. This contact then referred students to the keepers of relevant information.

In addition to ensuring that at least one person in Facilities Services had full knowledge of the class's data needs, this approach minimized unnecessary contacts between students and staff, efficiently directing students to pertinent records. In retrospect, developing a similar system for other important administrative units – including the offices of the Provost, Registrar, Budget, Food Services, and Institutional Research – would have been useful (Figure 1).

Students utilized the Clean Air-Cool Planet (CA-CP) Campus Carbon Calculator (v5.0) – the ACUPCC's recommended tool for meeting the carbon audit requirement – to conduct the audit. To ensure that students would understand how carbon calculators work, the class focused on the subject for the first three weeks of class. In addition, students studied the larger campus sustainability agenda, investigated how other American colleges and universities are responding to climate change, and assessed the role of carbon audits as diagnostic and planning tools. To highlight how institutional concerns differ from those of individual citizens, students calculated their own carbon footprints using various easily accessible personal carbon calculators and discussed their underlying assumptions. They also analyzed the CA-CP Calculator "User's Guide" and the ACUPCC "Implementation Guide" to understand both the work involved in conducting a campus carbon audit and the context in which the audit requirement originated. Finally, students read and analyzed the carbon audit reports produced at four small liberal arts colleges with similarly sized student bodies: Carleton, Middlebury, Smith, and Wellesley. These reports were published between 2002 and 2005 and ranged between 7 and 82 pages in length; two reports (Carleton and Smith) were prepared by a single paid student intern, one (Middlebury) was the product of a semester-long independent study, and one (Wellesley) was conducted by a ten-student class.

As students familiarized themselves with these issues, they divided into teams and conducted preliminary data collection and reporting in four areas, dating back to 1990, primarily to get a sense of how difficult their tasks were likely to be. The first team analyzed Facilities Services' annual energy reports, which combine the campus's main meter electricity purchases with the campus steam plant's annual production records (This process made it clear that existing energy reports would be insufficient, and that

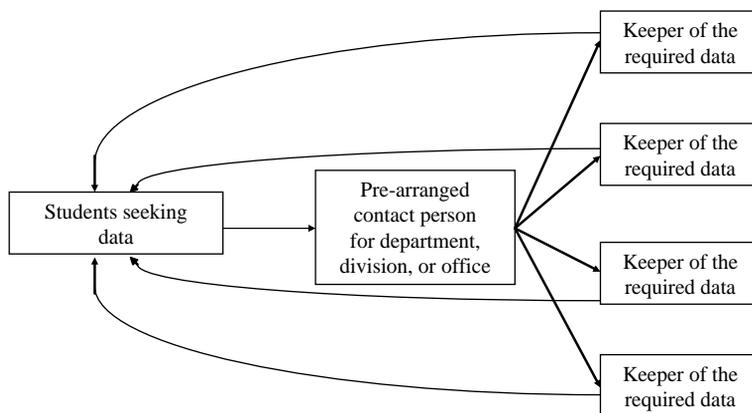


Figure 1.
Ideal system for data
collection

a group would have to devote a sizable portion of the semester to gathering the required data.) The second team collected historical information on the campus's square footage, demographic composition, and annual budget, which proved a relatively easy and straightforward process. The third team investigated the availability of records necessary for calculating the historical commuting patterns of faculty, staff, and off-campus students (Their investigation made it clear that transportation issues would require significant attention.) The fourth team researched and reported on recent campus sustainability activities at Macalester to help put the rest of the work in context.

After discussing the preliminary findings of these four groups, students split into two large groups – a seven-member Transportation Group, and an eight-member Everything Else Group. As their names suggest, the Transportation Group assumed responsibility for all of the areas of the calculator asking for information about transportation issues, while the Everything Else Group assumed responsibility for all remaining categories, including energy production and consumption. The students further organized themselves as necessary into subgroups for data collection and analysis.

The next nine weeks of the course were divided into three roughly identical segments (Figure 2). In the first two weeks of each segment, the two instructors met on a rotating basis with each team during the regularly scheduled class period, leaving the other group free to meet as a team to coordinate and conduct its work. Each team's meeting with the instructors began with a short formal presentation summarizing and assessing progress since the last meeting. Everyone then evaluated where the group stood and plotted the group's strategy for the next three weeks, assigning work as necessary. These meetings enabled the instructors to track the progress of each group, help students brainstorm solutions to various problems, suggest approaches they had not considered, and otherwise provide feedback, advice, and encouragement. The final week of each three-week segment brought the entire class together, reserving one class for formal 15-minute group presentations on their achievements and plans, followed by

- I. Instructors meet with key staff
(Facilities services, Provost, Registrar, Budget, Food service, Institutional research)
- II. Instructors decide on calculator tool (Clean air-cool planet calculator)
- III. Class structure
 - a. Week 1-3: Carbon audits and campus sustainability:
 - i. How do calculators work?
 - ii. What is campus sustainability?
 - iii. What projects are already in place on campus?
 - iv. How does the CA-CP calculator work?
 - v. Analyze other school's data
 - b. Weeks 4 -12: Conducting macalester's carbon audit
 - i. Rotating group meetings with instructors
 - ii. Group presentations
 - iii. Campus field trips (steam plant, food service, recycling)
 - c. Weeks 13-14: Putting it all together
 - i. Formal presentation to the presidents climate commitment committee
 - ii. Public presentation to the campus community

Figure 2.
Greenhouse gas emissions
inventory class outline

discussion of the state of the class's overall progress. The second class of every third week was devoted to a field trip or guest speaker that highlighted an important campus operation, including tours of the steam plant and the campus food-service operations, and a meeting with the CEO of the school's recycling company.

In the final week and a half, students finalized their report and presented their results, first to the school's Sustainability Committee, and second to the entire campus community. The results are shown in Figure 3.

V. Challenges and solutions

Since a class like this was unprecedented at Macalester, it was only possible to anticipate likely problems in broad terms. Scheduling regular meetings with each team, however, ensured that students would have help resolving unexpected problems on a case-by-case basis. Among the problems that were foreseeable by the instructors was the fact that much of the information students needed would likely be buried in filing cabinets and old databases, sometimes underneath several layers of bureaucracy or lost in a tangle of other data. It was also foreseeable that many of those who collected relevant information would no longer work at the school, and that some of the data-collection systems and reporting standards would have changed over the years. Collecting verifiable data was a top priority, so students were required to keep detailed work logs of their activities. This included keeping records of all contacts, the content of important conversations, a list of every data source analyzed (whether useful or not), the physical locations of all data sources, and any other information pertinent to the audit. Students submitted their work logs periodically for review, after which they became part of the carbon inventory's permanent supplementary files. To indicate the significance of this task, the work log assignment comprised 30 percent of each student's final grade.

The challenges that remained can be grouped loosely into three main categories:

- (1) logistical problems arising from students trying to gain access to such a wide range of records;

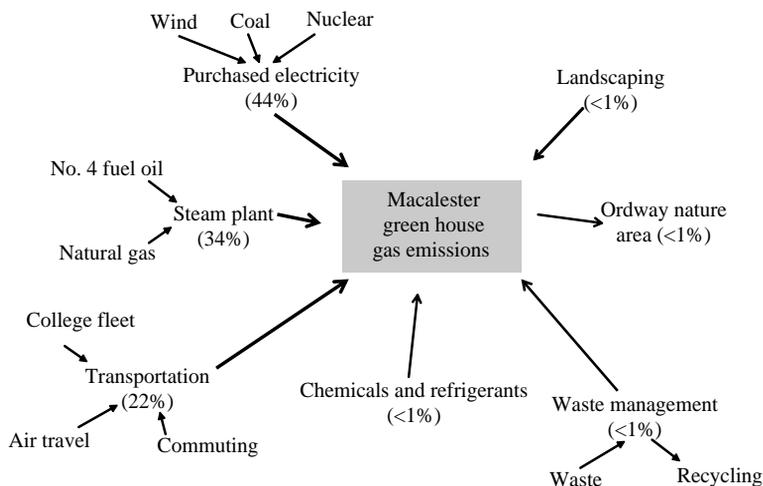


Figure 3.
Macalester College
greenhouse gas emissions,
2006

- (2) missing and incomplete data; and
- (3) unevenly distributed workloads.

A fourth anticipated problem – friction among students working on team-based assignments – fortunately never materialized.

The logistical problems of data collection were particularly instructive. As indicated above, designating a single contact in Facilities Services proved successful, and similar arrangements elsewhere would have been a good idea. Events also demonstrated the utility of coordinating contact between offices as well as within offices. Early in the process, for example, students needed information in an obsolete database that required setting up an old computer with old software to access the data. Students approached staff in both Institutional Research and the Registrar's Office about acquiring information housed in this old system, and people in both offices were independently wrestling with how best to access it until a chance conversation revealed this duplication of effort. As a result, the class adopted a protocol requiring students to share their work logs with everyone they approached for help so that their contacts would understand the project's scope and how people in other parts of the college were contributing. This incident also highlighted another persistent problem facing students seeking data; they often had to talk to many people – and sometimes had to wait substantial periods – before getting the data they needed.

Unfortunately, waiting did not always produce data, and missing, incomplete, or difficult-to-work-with data persistently plagued students' efforts. Sometimes records lacked the required resolution, as with pre-2007 budget records that failed to distinguish school-financed air travel from school-financed rental cars, hotel rooms, restaurant meals, and conference registration fees, all of which were grouped under the broad accounting category "travel." Similarly, even after the accounting system changed and distinguished air travel from other expenses, the data did not differentiate between domestic and international flights, which have very different conversion factors for translating dollars spent into greenhouse gases emitted. In other instances, existing paper records were simply too vast to work with efficiently. Old faculty-staff directories were available, for example, and included addresses that would have been useful in calculating employee commuting distances. Since the directories were not digitized, however, students and members of the Provost's Office worked out a way to sample the data rather than undertaking an exhaustive data-entry project. In many areas, records either were not kept or had been lost.

These sorts of problems had to be solved on a case-by-case basis and comprised the most difficult intellectual work of the audit. Students devoted a large portion of their meetings with the instructors to discussing and sorting through these issues, giving the instructors a chance to help students weigh the pros and cons of various approximations. The emphasis throughout was on acquiring complete, reliable data wherever possible, and on developing sound methodologies for approximating missing data.

The final persistent problem was that of unevenly distributed workloads. Most of the students at one point or another had relatively little work, usually while waiting – sometimes for weeks – for a contact to deliver crucial data. Likewise, most of the students also had periods with very high workloads, as when they were processing, manipulating, and interpreting data; developing workarounds for missing information; putting together presentations; and writing and editing the final report.

Sometimes, even when the workload was high, their tasks felt like “busy work,” as when they were fruitlessly trying to identify or contact the caretakers of certain records. The instructors tried to solve these problems by promoting better communication among groups, encouraging students to shift around within groups as their workloads waxed and waned, and suggesting that they ask each other for help during periods when their workload swelled. At best, however, such approaches mitigated rather than solved these problems, which seem to be challenges inherent to conducting a carbon audit. Carbon emissions have not historically been on the radar of most college and university administrators, and not surprisingly they have not assiduously collected the data that is necessary for a thorough audit. Interestingly, however, this seemed to heighten the sense among students that this project gave them more “real world” experience than typical college coursework.

VI. Learning outcomes and course modifications

Measuring student learning in a variety of ways, it is clear that conducting a campus carbon audit gave students a valuable educational experience. It is common for environmental studies courses either to study or to address local environmental issues. Such classes by their nature contain elements of place-based education and/or service-learning. Place-based education is defined as a deep involvement with features of the immediate surroundings such as architectural landmarks, local history or ecology. Service learning focuses on civic engagement and social needs. Research has shown place-based education increases students’ motivation and engagement with academic material (Powers, 2007) and service learning can have academic benefits such as ability to apply knowledge (Conway *et al.*, n.d.), social benefits such as teamwork and leadership skills (Vogelgesang and Astin, 2000), and personal benefits such as self-confidence (Astin and Sax, 1998). In addition, service learning can influence later career choices (Astin *et al.*, 2000).

This course was both place-based and had a service-learning orientation. It was place-based in that students became thoroughly familiar with their immediate surroundings and campus operations. It fulfilled the characteristics of service-learning described by Bringle and Hatcher (1999): coupling classroom work with an organized service activity, meeting a clear community need, and providing students with opportunities for structured reflection. The value of their service became especially clear when the students presented their findings to the college Sustainability Committee and then to the campus community. The large number of attendees at the presentations and the questions that the audience posed were compelling evidence that the students had provided something valuable to a wide cross-section of students, faculty, and staff.

In addition to these features, the course enhanced students’ educational experience in several other ways. First, the course required teamwork, giving students the opportunity to work together to answer questions and develop solutions. Second, the course involved real-world data rather than hypothetical examples from a textbook. Third, students created tangible products, both in their work logs and in the final audit report. Finally, the course required students to apply classroom learning to a real-world problem, and to draw on interdisciplinary knowledge, personal creativity, and group ingenuity to develop strategies, find workarounds, and solve problems.

End-of-semester course evaluations and summer e-mail communications provided anecdotal evidence that the course had indeed fulfilled many of these

hypothesized benefits. An online follow-up survey was developed with SurveyMonkey to better understand these outcomes. The survey comprised four sections for students to subjectively evaluate:

- (1) amount of change in their understanding, interests, and goals;
- (2) amount the course increased various real-world skills;
- (3) “real-world” course aspects that were most motivating; and
- (4) activities they found most useful.

The survey was posted approximately two weeks after graduation and an e-mail was sent to all 15 students, providing a link and inviting them to participate online. A total of 12 students (an 80 percent response rate) took the survey, which is available at: www.surveymonkey.com/s.aspx?sm=8f4uCwocBPTnUHa307sJiA_3d_3d

The survey results confirm that students learned much about the course topic: the campus carbon footprint. All respondents agreed that their knowledge of this topic had increased, with more than half of the respondents (eight out of 12) saying that it had created a very large change in their knowledge. Their increased knowledge also went beyond the specific course topic. Many respondents (seven out of 12) agreed that the course had increased their knowledge of their personal carbon footprint a moderate to very large amount. According to the survey, the most useful aspects of the course were the main carbon audit data collection, followed by small group work and outside speakers.

Survey results bolster our anecdotal evidence that the course’s focus on campus-based service provided students with unique benefits. Many respondents reported increases in real-world skills as a result of participating in the course. All 12 felt better equipped to deal with incomplete data, and 11 of 12 felt better able to work with a team. Ten of 12 reported improving their understanding of data collection methods. Finally, eight of the twelve said they were better able to apply interdisciplinary knowledge and to develop creative problem-solving solutions.

Perhaps, the most intriguing survey results were the reports of what most motivated students to learn the academic material. As environmental studies majors, it is not surprising that ten of 12 felt highly motivated by the importance of the course topic. Beyond this, respondents reported being highly motivated by the fact that the course created something useful (nine of 12), resulted in a tangible accomplishment (eight of 12), and allowed students to gain useful skills (six of 12). Of 12 students, 11 also reported they were at least moderately motivated by the project’s campus-based focus.

Despite the course’s success, there are certain areas that could clearly be improved. The course’s structure, for example, assumed a high level of knowledge about climate change and its context. Midterm evaluations revealed, however, that students wanted to delve more deeply into the Kyoto Protocol and the Intergovernmental Panel on Climate Change reports. Students also asked for more intellectual connections between their data collection work and larger environmental problems. In response, supplementary readings were added for the field trips focusing on how food production, energy consumption, and recycling contribute to global warming, but a larger section on the science and the politics of climate change would probably have been preferable.

Students would also have benefited from more structured time to develop recommendations based on the audit. Data collection took up the majority of the semester, but many of the questions directed at the students during their presentation

revolved less around the audit itself and more around their recommendations for how the campus might reduce its emissions. More time developing concrete recommendations based on their audit results would have increased the intellectual rigor of the course and increased the usefulness of the students' recommendations.

VII. Next steps

The student-collected data (available at: www.macalester.edu/sustainability/2008Audit.pdf) will help Macalester's Sustainability Committee prioritize the different elements of its plan to reduce the campus's greenhouse gas emissions, which will be a part of a larger sustainability plan that is currently under development. The students' data will also be used to develop a more efficient data-gathering process for the next inventory. One of the students was hired by the Sustainability Office after his graduation to assist with both of these projects during the 2008-2009 academic year.

VIII. Conclusion

Using a class to develop the greenhouse gas emissions inventory required of ACUPCC signatories provided Macalester College with necessary, timely, high-quality data, and achieved a historical depth that would have been impossible to attain without the class. The class provided an enriching academic experience and useful career skills for the students involved. If the instructors were to teach the class again, they would include a unit on the science and politics of climate change, and would require students to develop recommendations based closely on the results of the carbon audit. On balance, the class can be considered a clear success and a workable model for other schools as they consider conducting their own campus greenhouse gas emissions surveys. Moreover, as Macalester moves towards fulfilling its own ACUPCC commitments, the class's audit has already had an appreciable positive impact. Many student recommendations for how to modify key data collection practices have already been implemented, for example, which should improve the quality of future audits while streamlining the process of making annual updates to the original emissions inventory.

References

- Astin, A.W. and Sax, L.J. (1998), "How undergraduates are affected by service participation", *Journal of College Student Development*, Vol. 39, pp. 251-63.
- Astin, A.W., Vogelgesang, L.J., Ikeda, E.K. and Yee, J.A. (2000), *How Service-learning Affects Students*, UCLA Higher Education Research Institute, Los Angeles, CA.
- Bingle, R.G. and Hatcher, J.A. (1999), "Reflection in service learning: making meaning of experience", *Educational Horizons*, Vol. 77 No. 4, pp. 179-85.
- Clugston, R. and Calder, W. (1999), "Critical dimensions of sustainability in higher education", in Filho, W.L. (Ed.), *Sustainability and University Life*, Peter Lang Publishing, New York, NY, pp. 31-46.
- Conway, J.M., Amel, E.L. and Gerwien, D.P. (n.d.), "How much do we learn from community service learning? A meta-analysis of academic, personal, social, and citizenship outcomes", *Teaching of Psychology*, Vol. 36 No. 4 (in press).
- Cortese, A.D. and McDonough, W. (2001), "Education for sustainability: accelerating the transition to sustainability through higher education", *Environmental Grantmakers Association News & Updates*, Spring, pp. 11-14.

- Creighton, S.H. (1998), *Greening the Ivory Tower: Improving the Environmental Track Record of Universities, Colleges and Other Institutions*, MIT Press, Cambridge, MA.
- Eagan, D., Keniry, J. and Schott, J. (2008), *Higher Education in a Warming World: The Business Case for Climate Leadership on Campus*, National Wildlife Federation, Reston, VA.
- Keniry, J. (1995), *Ecodemia: Campus Environmental Stewardship at the Turn of the 21st Century*, National Wildlife Federation, Washington, DC.
- National Wildlife Federation (1998), *Green Investment, Green Return: How Practical Conservation Projects Save Millions on America's Campuses*, National Wildlife Federation's Campus Ecology Program, Washington, DC.
- Orr, D. (1991), "What is education for? Six myths about the foundations of modern education, and six new principles to replace them", *Context: A Quarterly of Humane Sustainable Culture*, available at: www.context.org/ICLIB/IC27/Orr.htm (accessed August 10, 2008).
- Orr, D. (1994), *Earth in Mind: On Education, Environment, and the Human Prospect*, Island Press, Washington, DC.
- Powers, A. (2007), "An evaluation of four place-based education programs", *The Journal of Environmental Education*, Vol. 35 No. 4, pp. 16-32.
- Rappaport, A. and Creighton, S.H. (2007), *Degrees That Matter: Climate Change and the University*, MIT Press, Cambridge, MA.
- van Weenen, H. (2000), "Towards the vision of a sustainable university", *International Journal of Sustainability in Higher Education*, Vol. 1 No. 1, pp. 20-34.
- Vogelgesang, L.J. and Astin, A.W. (2000), "Comparing the effects of service-learning and community service", *Michigan Journal of Community Service Learning*, Vol. 7, pp. 25-34.

Further reading

Science Education Resource Center (2008), "Climate change collection", available at: <http://serc.carleton.edu/climatechange/summary.html> (accessed August 6, 2008).

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