
Educating Students in Green Computing

Mary V. Connolly
Saint Mary's College
Notre Dame, Indiana 46556
574-284-4497
connolly@saintmarys.edu

Students today literally live electronically. Any walk across campus reveals students connected to others and to the Internet by all kinds of devices. Laptops are a standard part of a book bag. Constant connectivity is simply the current environment for college students. There is however an environmental cost for all these devices. Computers and the huge variety of accessories all use power. All those hand held devices need to be recharged. Do students today ever think about how much power they are using? More to the point, do colleges and universities (admittedly in the business of education) do a good job of making students aware of the environmental costs of computing? Is it easy for a student to find information about controlling the amount of power used for a computer, a monitor and various accessories on the campus web site? Will a student find out how to save printing costs? Will a student who is **not** looking for this information come across it easily and be encouraged to act on it? This paper will present some of the best ideas on how to do this as well as examples of campuses which do not seem to address the problem.

One would hope that schools with ample resources might be leaders in this area. Hence the author chose to survey the top ten liberal arts colleges in the country and the top ten national universities, as identified by the December, 2009 U.S. News and World Reports rankings. [1] Since students live on line, and one of the questions to be answered was how easy it was to find information about green computing, it seemed reasonable to survey all twenty schools by examining their web sites and following the links provided. It should be noted that the author was willing to be quite persistent. If an immediate link did not show up and a search facility was available, the author tried searching for such topics as sustainability, green computing, etc. On all sites it was relatively easy to get to a page of the campus equivalent of the Information Technology Department.

ASCUE members have had a fine example of the sorts of resources which can easily be provided in the work of Tom Marçais. His paper entitled "Green Computing – It IS Easy Being Green" was presented at the 2008 annual ASCUE meeting. His paper addressed issues such as power management, screen savers, peripherals, buying and recycling equipment, and reducing both paper and CDs/DVDs. [2] These are all important when attempting to be more responsible about our natural resources, but often students don't think about these issues or they simply are misinformed.

Let's look first at the top ten liberal arts colleges. While they vary somewhat in student enrollment (from 1170 to 2350), they are relatively small schools. Some of these colleges make an impressive effort to educate and encourage students to be responsible users of our natural resources. Others seemingly make only a small effort. Williams College tops the U.S. News and World Reports list. It is one of the few colleges with a link to Information technology available on the home page when one types in the URL for Williams. With three quick and rather obvious

clicks, one arrives at a good half screen of information addressing turning off the computer, not using a screen saver and saving on paper when printing. A further link takes one to more detailed information, including information on saving power by changing light bulbs and getting rid of mini refrigerators. [3] There is also a link for a great page describing how much electricity various models and makes of computers use. This was done by interns in the summer of 2006. Admittedly, this is something that has to be kept up to date, but it is a task which can easily be handled by students.

Although virtually all colleges and universities are concerned about issues of sustainability in some way, many are looking at this with a wider focus and have not yet put information about green computing on their web sites. Amherst and Swarthmore are good examples. In just a couple of clicks, one can get to a site at Amherst with links to many issues dealing with sustainability. [4] The site describes a number of awareness and promotional campaigns, including the results of a dorm energy competition. However, the link to Green Computing leads to a page which says that information is coming soon. At Swarthmore the Sustainability Committee (charged with making recommendations to improve environmental sustainability on campus) made recommendations to Information Technology Services, asking them to educate the community. One assumes that this is a work in progress, with nothing yet on the web site.

Haverford College also falls into the category of schools which are taking a broader view of sustainability without putting focus on the natural resources consumed by computing. The Committee for Environmental Responsibility is clearly active and working on a number of projects. This committee has a page entitled Going Green @ Haverford with a report on their activities. There is a link to this under the blogs section of the main page.

Carleton College also is taking a broad view of sustainability. From the main page, one click takes one to Campus Life. On that page is a link to Sustainability. Some important programs, including the installation of a 1.65 Megawatt wind turbine and the completion of LEED GOLD certified residence halls, are described. The Pledge of Sustainable Conduct brings individual responsibility into focus. Included in the pledge are actions a signer can take to reduce power usage, including a sentence encouraging turning off a computer when it is not in use.

Middlebury's information is similar, but even easier to find than Carleton's. Sustainability is a prominent link on the home page. Middlebury hosts the oldest undergraduate environmental studies program in the country. From its Sustainability page there are links to pages describing work in many areas, including energy, food systems, sustainable design and transportation. Under Tools and Resources there is some information about powering down computers and accessories when not in use and about controlling paper waste when printing. Again, the focus is on larger projects.

Wellesley College had a page with good information on power usage, printing and recycling in the fall. In the spring this information seems to be found via a link from the sustainability page. It took perseverance to find this![5] Davidson provides a little more information and the information is easier to find. From the home page, one goes to Services and then to IT. On that page is a link to Sustainability with additional links to information on power usage, printing, etc.

A couple of colleges have done impressive work at helping their students understand responsible use of natural resources in dealing with technology. Bowdoin College (at least in February) had

a direct link from one of the pictures on its home page to a page which gave a real time report of the electrical consumption in campus buildings, including residence halls. On the home page of the site for Information Technology there was a wonderful paragraph encouraging everyone to turn off computers, monitors, etc. when going on break. A couple more links takes one to the Sustainable Bowdoin website. From there more links take one to Energy Conservation and Green Computing Tips. The information is well done and relatively easy to find. Along the way one can learn something about polar bears (who don't really hibernate, but your computer can!). It is definitely worth a visit! [6]

The real prize among the top ten liberal arts colleges goes to Pomona College. Sustainability is a direct link from the college's new home page. Then there is a link to the Sustainability Action Plan. Under Tools and Resources – Publications, one finds [The Little Green Book: A Guide to Sustainable Living at Pomona College](#). The book consists of 36 well designed pages of information, all clearly intended to gently guide students to pay attention to our natural resources. There is detailed information on recycling virtually everything as well as extensive information on power usage. Not only is there a table listing the energy usage of common computers, but the same page also lists energy usage for items such as DVD players, TVs and Wiis. The section dealing directly with computers is very detailed. For example, students are advised to use a cooling pad when using a laptop on their laps. They are also advised to avoid putting laptops on soft surfaces. Reasons are explained without overwhelming details. The Little Green Book covers all aspects of student life. The book will even tell you when your favorite fruits and vegetables are in season (remember, this is California!). However, compared to all the other top ten liberal arts colleges, the information about green computing alone is clearly the most detailed and helpful. Students were involved in putting this together, which is probably one reason why the book seems so attractive to a student population. One could argue that students attending these top ten colleges should already know how to save power, print responsibly, and recycle electronics. Given the power consumption at most colleges, this probably is not a good assumption. Pomona obviously thought it was better to be proactive and educate their students in these areas not just for life at college, but for life after college.[7]

Turning to the top ten national universities, one expects to find substantive and broad initiatives in many aspects of sustainability. These are very large schools with home pages which must meet multiple needs. An individual student looking for information on how to control the power used by a computer or how to recycle an old computer certainly would not expect to find this in one or two clicks starting with the home page. Nevertheless, large as these universities are, they still have students who can benefit from thinking about their individual carbon footprints. Harvard and Princeton tied for first in the top ten list in December, 2009. Harvard has done an impressive job at balancing the actions which the university can take to respect natural resources and the need to educate all members of the community about possible individual actions.

Harvard's Office for Sustainability was established in the fall of 2008; it was formed from an existing organization, Harvard Green Campus Initiative, which dated back to 2000. The web site for Sustainability at Harvard contains a number of very helpful links.[8] One takes you to the Office for Sustainability and its Mission Statement which addresses work in many areas. Under Places – Home & Dorm, one finds a link to the sustainability pledge. The introductory paragraph points out the Harvard tackles reducing its environmental impact from two sides – making changes as a university while encouraging all members of the community to green their own habits. The pledge, definitely meant for individuals, including all students, lists several items

under the headings of energy, food, water and waste. The very first item under energy addresses setting the sleep mode on a computer and monitor. The “Green Tip of the Month” feature offered by the Office of Sustainability is available to anyone, not just Harvard community members. Overall the web site for Sustainability at Harvard offers an abundance of information about current efforts and possible actions, both large and small. No one could doubt the where sustainability ranks in the priority list at Harvard if they happened to visit the home page of the university on April 1, 2010. Banners proclaiming that “GREEN is the new Crimson” took center stage on the home page, with a direct link to the Office of Sustainability. This was no April Fool’s joke, but rather a visual way to bring attention to the environmental consequences of our actions.

Princeton also has an Office of Sustainability which maintains a web site with information on projects and research as well as a report on sustainability at Princeton.[9] Unfortunately, the link to “Guide to Living Green at Princeton” on the student initiatives link did not work at the time this paper was written. There are currently 11 student environmental groups representing a range of issues, with 8 of these started since 2004. Clearly some of the students are concerned, but currently a student would be hard pressed to find information about individual actions that could reduce the carbon footprint of technology usage.

Just as with the top ten liberal arts colleges, the top ten universities vary quite a bit, from some which offer almost no information on the environmental cost of computing to others which have robust plans and resources, both for the university as a whole and for an individual student. California Institute of Technology maintains a web site on sustainability at Caltech. The site offers information about efforts in multiple areas, but is really more geared to employees. Efforts to find information which would help students reduce their carbon footprint when using technology were unsuccessful. Maybe we should assume that Caltech students already know this. Certainly these students are contributing to the cause by the basic research that is being done at Caltech.

Likewise, it was difficult to find this kind of information at the University of Chicago. The University of Chicago also maintains a website, Sustainability at the University of Chicago, which serves as a portal to a wide variety of activities, initiatives and programs. [10] There is very little focused information on green computing for students, but there is a link to a nice guide entitled “Greening Your Apartment,” an appropriate guide for students at the University of Chicago.

Both the University of Pennsylvania and Duke provide some good suggestions without extensive detail. The GreenIT website maintained by the University of Pennsylvania is a fine resource for those wanting to “green up” their computer usage. There are lots of good suggestions on one page with links on the side to more information.[11] The University also encourages its community members to take a pledge to incorporate various sustainable practices into their everyday lives.[12] Second on the list of practices is setting the computer to sleep mode. In February, on Duke’s Sustainability site, the second Green Devil Challenge was issued. Community members (faculty, students and staff) were encouraged to take the Duke Carbon Calculator to determine how much carbon they produce at Duke while eating, studying, traveling, etc. From the Take Action link, one gets to “Ten Quick Actions to Lower Your Impact.” The third action addresses technology.[13]

The Yale Office of Sustainability maintains a website which details the expected university wide efforts at sustainability. A link takes one to the pledge, which encourages an individual com-

mitment to sustainability – “a crucial step towards a sustainable campus.” [14] Rather than present a checklist, each person taking the pledge is asked to type in specific actions he or she will take. This, of course, requires those taking the pledge to be educated about possible steps an individual can take to reduce their own carbon footprint. There is another link from the Office of Sustainability page to the Student Taskforce for Environmental Partnership (STEP). STEP is designed to educate the Yale community about sustainability. Links from the STEP page lead one to good information on saving energy, including references to technology. Clearly Yale students are taking the lead when it comes to educating individuals in the community on reducing their carbon footprint.

Among the top ten universities, the three that stand out in terms of educating individuals about green computing, are MIT, Stanford and Columbia. MIT sponsors an annual set of events to educate, inspire and engage the MIT community in all things energy. There is a direct link on the MIT website to energy initiatives. One more click yields campus energy activities with the top of the page entitled “Help MIT Walk the Talk on Energy and the Environment.” This is followed by good information with many links to additional information. Just to the side there is a clever logo called “greeningmit.” Clicking on this reveals a wealth of practical advice, with heavy emphasis on the energy consumption of computers. It is not surprising that MIT is taking a lead in energy related activities, but it clearly also takes the prize for making the information for individuals easy to find. [15]

Stanford’s website on sustainability is well designed and easy to navigate. [16] Under the heading “What We’re Doing” are links to projects in multiple areas with the same broad focus common to many of the large universities. However, Stanford’s progress is impressive. In 2008-2009 Stanford was the only school in California to receive the highest ranking for leadership in sustainability out of 300 colleges and universities surveyed for the College Sustainability Report Card. [17] Under the heading “What You Can Do” are links for students and for faculty and staff. The student link leads to “Get in on the Action” and then to “A Students’ Guide to Sustainable Living at Stanford,” a full and complete guide similar to the guide developed at Pomona. The guide addresses all areas of student life, and gives full and complete information on the energy used by computers, peripherals and other electronic equipment. The table on page 8 listing energy consumption by all these devices when active, when in standby mode, when hibernating and when turned off is convincing and easy to read. This guide was presented in the orientation for new students in the fall of 2009. This is an easy step to imitate at other campuses; educate our students as they begin their college careers!

Columbia University is a leader in research on climate change and sets an example of long-term environmental sustainability both on its campus and in the daily lives of its community members. The Office of Environmental Stewardship initiates, coordinates and implements programs to reduce Columbia’s environmental footprint. [18] There is a direct link from its web site to the “Guide to Green Computing,” perhaps the most complete guide found on any of the 20 colleges and universities surveyed. The guide covers all areas thoroughly, including common myths, purchasing, power management, printing and upgrading and disposal of old computers. It contains an excellent discussion of how many kilowatts a typical desktop PC with a 17 inch flat panel LCD monitor uses. The discussion is convincing and written in layman’s terms. This guide is exactly the kind of document every incoming first year student should have in hand before buying a computer for college use. Columbia has made this information easy to find.

Virtually every college and university is working on issues of sustainability. The College Sustainability Report Card (mentioned above in connection with Stanford) rates colleges and universities in 9 different areas, including administration, climate change and energy, food and recycling, green building, student involvement and transportation.[19] The 2009 report card give the highest rating (an A-) to only 15 schools. From the schools considered in this paper, Middlebury, Carleton, Harvard, Stanford, the University of Pennsylvania and Columbia were included. In the 2010 ratings in which 332 schools were surveyed, 27 schools received a grade of A-. Nine of the schools considered for this paper were included. Schools were included in the survey if they had \$160 million or more in endowment assets.

Exemplary work on sustainability should involve campus wide initiatives as well as actions to get individuals to make more appropriate choices. In many cases, good information is available on a campus website, but it takes work to find it. This is not an area in which we can be complacent. If we are going to change the habits of our campus citizens, the needed information has to be visible and easy to find. It should be pointed out that the topic of this paper is a moving target. All colleges and universities care about sustainability. Programs, initiatives and educational actions are taking place at a rapid rate. Hopefully green computing will soon become almost automatic!

References:

1. U.S. News & World Report Rankings – Best Colleges 2010
 - a. <http://colleges.usnews.rankingsandreviews.com/best-colleges/liberal-arts-rankings>
 - b. <http://colleges.usnews.rankingsandreviews.com/best-colleges/national-universities-rankings>
2. Marcais, Tom: “Green Computing – It IS Easy Being Green.” Proceedings of the 2008 ASCUE Summer Conference. June, 2008.
3. Williams College Office for Information Technology
 - a. <http://wiki.williams.edu/display/docs/Green+Computing>
4. Green Amherst – Sustainability www.amherst.edu/campuslife/greenAmherst
5. Wellesley College – Sustainability
 - a. www.wellesley.edu/AdminandPlanning/Sustainability/conservationtips.html
6. Bowdoin Sustainability
 - a. www.bowdoin.edu/sustainability/campus-involvement/energy-conservation
7. Pomona College www.pomona.edu
8. Sustainability at Harvard <http://green.harvard.edu>
9. Sustainability at Princeton www.princeton.edu/sustainability
10. Sustainability The University of Chicago <http://sustainability.uchicago.edu>

11. Penn Computing www.upenn.edu/computing/greenit
12. Penn Green Campus Partnership www.upenn.edu/sustainability/pledge.html
13. Duke Sustainability <http://sustainability.duke.edu>
14. Yale Sustainability Pledge www.yale.edu/sustainability/pledge
15. MIT Energy Initiative www.mit.edu/mitit
16. Sustainable Stanford <http://sustainablestanford.stanford.edu>
17. The College Sustainability Report Card www.greenreportcard.org
18. Columbia University Environmental Stewardship www.environment.columbia.edu
19. The College Sustainability Report Card www.greenreportcard.org