CUSP (CU I&E) Submission: The Green Labs Initiative [1]

Description

Idea: Creation of a CU-Boulder Green Labs Program to benefit conservation and cost savings with a focus on energy savings, water savings, and material & hazardous waste reduction in scientific campus laboratories.

When it all began in 2007: an idea that became a successful pilot

In 2007, I was working at CU-Boulder as a Research Associate conducting scientific research in a biochemistry lab in the Department of Chemistry and Biochemistry. There were stickers by the light switches asking occupants to turn off the lights when not in use, but there was nothing to address the abundance of lab-specific conservation opportunities that surrounded us. As the lab member who would frequently write environmental quotations on our white board and as the most senior person working in the lab (essentially functioning as a lab manager for the Principal Investigator (Robert Kuchta)), I started to figure out how to turn off our equipment when it was not in use in our lab and asked the other lab members to do the same by posting instructions on equipment where needed. Once that was implemented, I thought, “Why stop there?” I knew just about everyone in the Biochemistry division, and there was so much more equipment that could be turned off when not in use. Copying a title I had heard used for the CU Green Office Program, I asked my colleagues and friends in other labs if they would be “Eco-Leader” representatives for their labs. In our spare time, we worked together to find other equipment that could be properly turned off when not in use. I also brought some Kill-A-Watt meters from home, and we started metering equipment so that we could know the impact we were having. For equipment that we could not meter, I asked repair technicians and manufacturers for consumption information. I presented the resulting energy saving findings and other actions for waste diversion in a poster at the Biochemistry retreat in September 2007. Then in November 2007, without warning, I had to leave work due to a troubled pregnancy. I was sure that this idea, which had turned into a CU Green Labs Program pilot, would fall apart in my absence, but it didn’t. When I finally got the chance to check back in on the pilot in the Spring of 2009 after more than a year of focusing 100% of my time on caring for my prematurely born twin daughters, I discovered that most pilot efforts continued despite my absence because the Lab Eco-Leaders had taken on responsibility for those conservation efforts. I thought to myself, “This could really work.”

Funding for CU Green Labs began July 1st, 2009

In the spring of 2009, the Environmental Center Energy Program Manager (Robert Hall) and Facilities Management Sustainability Officer (Moe Tabrizi) were looking to do a campaign or contest focused on energy conservation in labs. I offered to organize a meeting with Lab Eco-Leader colleagues to explore ideas. As a result of that meeting, it became clear that there were far more opportunities for conservation than a single contest or campaign could cover.

With the support of Rob Hall and Moe Tabrizi, I wrote a proposal with my ideas, and they found matching funding from the Environmental Center and Facilities Management to hire me on July 1st, 2009 as a part-time, temporary employee to give CU Green Labs an official try for six months. This trial period was followed by a year contract to continue the effort in 2010 and then another year contract in 2011 until a permanent CU Green Labs Program Manager position was created in 2012. Additional funding was also provided to cover operational expenses and hire student employees (the program presently employs up to 10 students). To this day, the program is still equally supported and funded by Facilities Management and the Environmental Center.

The CU Green Labs Program Today: A program focused on engaging lab members that has evolved to a collaborative, team approach involving numerous campus stakeholders

In 2007, the CU Green Labs pilot was focused on engaging lab members to take action for conservation in their own labs. That has continued to be a focus of the program through contests, personal outreach, positive & public recognition, incentives, posters, and other forms of communication. The program aims to be a resource for campus labs, to raise awareness, to utilize the expertise of scientists to identify ideas, and to especially look for opportunities that are a win for conservation and a win for research. The program presently has about 140 labs with Eco-Leaders and a presence in most lab departments on campus, some much more than others.

In 2009, when the program officially began, it became apparent that the program would also be about partnering for conservation. The program has evolved into a campus-wide, collaborative team approach to conservation in labs partnering with stakeholders including lab members (students, staff, and faculty), lab departments, Facilities Management, the Environmental Center, CU Recycling, Environmental Health and Safety (EH&S), and, recently, Procurement. CU Green Labs acts as a place to solicit, generate, & receive ideas; connect partners, resources, funding & expertise; and coordinate implementation or hand off a project to the appropriate person/group.

To give a sense of the range of projects resulting from the CU Green Labs Program, a brief description of a single example project for each of the following conservation categories is provided below:

Equipment Off When Not In Use: For example, the CU-Boulder Ecology and Evolutionary Biology Department has a scanning electron microscope which is infrequently used. Typical for electron microscopes, the instrument was being left on 24/7. For significant energy and water savings, the lab now keeps the instrument off when not in use except every two weeks when the lab turns it back on to maintain the instrument's required vacuum.
Alternative to Single Use Water for Cooling: For example, Findensers, or water-free reflux condensers, are successfully being used by some organic chemistry lab members as an alternative to water-cooled condensers. Not only do Findensers avoid water use, they also avoid the risk of flooding in lab that can be caused by tubes popping off water condensers during overnight or over the weekend reactions.
Equipment sharing: For example, when the Hoenger Lab's Ultra Low Temperature (ULT) freezer failed, CU Green Labs connected that lab with the Detweiler Lab, which had previously contacted CU Green Labs to offer half of their ULT freezer to another Molecular, Cellular, and Developmental Biology Department lab. This project saved significant research funds and energy since ULT freezers are costly and typically consume the same electricity as

a small house.
Replacement of Energy Inefficient Equipment: For example, the Falke Lab in Biochemistry replaced two ULT freezers using a combined 44.6 kWh/day (24.6 kWh/day and 19.2 kWh/day according the freezer manufacturers) with a single, large chest ULT freezer using 10.5 kWh/day for an electricity reduction of 76%.
Solid Waste Diversion: For example, CU Green Labs launched and maintains pipette tip box recycling on campus, which started in 2012. This #5 PP plastic, lab-specific waste stream is presently diverted from the landfill at a rate of greater than 5 tons/yr.
Hazardous waste reduction: For example, the Department of Chemistry and Biochemistry began collecting, distilling, and reusing acetone that primarily had been used to rinse lab glassware. This reuse is saving the department about $2000/year in avoided acetone purchases and is reducing hazardous waste generation by more than 200 gallons/year.
Ventilation Reduction: For example, approximately 200 of CU-Boulder's 500 fume hoods, are variable air volume (VAV) which save significant ventilation, and thus energy, if sashes are lowered when not in use. Because fume hoods are frequently one of the most energy intense pieces of equipment in the lab, CU Green Labs maintains on-going periodic monitoring of campus VAV fume hood sashes and encouragement of good sash behavior which also benefits lab member safety.

How does this impact the University?

CU-Boulder has approximately 400 labs that occupy over 2 million square feet of lab space. Labs have been identified as one of the largest energy consumers on campus. In 2010-2011, a study by Facilities Management found that CU-Boulder laboratories at that time occupied 1/5 of the campus square footage but were responsible for 43% of its energy use.

The CU Green Labs Program brings to campus energy savings, water savings, hazardous waste reductions, and solid waste diversion in one of the most resource intense and complex spaces on campus. Because of the large environmental footprint of labs, it is important that these spaces are included in campus conservation efforts to meet climate commitment and waste diversion goals. Of course, this inclusion also means ongoing cost savings to the university. Between the program's creation in the summer of 2009 and the end of the 2014 calendar year, it is estimated that the program has implemented or helped to implement efforts resulting in a cumulative impact of $79,000/year (720,000 kWh/year) in electricity savings, $34,000/year (5 million gallons/year) in water savings, $50,000/year or more in heating and cooling savings, 28,000 lbs of foam, pipette tip boxes, & plastic film recycled, and 500 gallons of solvents recycled.

However, the program is having impact on campus beyond just these savings mentioned above. The program is benefiting communications and relationships between scientists and EH&S and between scientists and Facilities Management, groups that often need to work together on campus. The program is also giving scientists a voice on lab-specific conservation, which they did not have before. Many scientists care about the impact of their research on the environment, and now they have a place to bring their ideas. CU Green Labs even offers something for those scientists who are less environmentally inclined. As mentioned earlier, the program strives to find conservation opportunities that are a win for science and a win for conservation. Thus, it is not uncommon for CU Green Labs to work on projects that will benefit research. Some examples include the use of processed chilled water rather than single use tap water which is of benefit to water savings and instrumentation

because it provides a more consistent cooling temperature, mobile freezers for labs to borrow which benefit freezer sample cleanouts minimizing the purchase of additional freezers while also providing labs with a back-up in case of a freezer failure, and financial incentives for energy efficient equipment purchases which help labs stretch lab budgets while saving energy.

Lastly, the program is also a recognized national leader by those in the green labs community and thus is benefiting CU-Boulder's reputation. When CU Green Labs started in 2009, it was one of about five university green lab programs in the nation. Now it seems as though most large and even some small research universities are starting green labs programs, many of which reach out to CU Green Labs for consultation, and even sometimes visit our campus, as they look to start a green labs program. As a result, the CU-Boulder Green Labs Program is influencing the creation of new programs across the nation. The program is particularly known nationally for engagement of scientists in conservation and lab-specific conservation posters, which even the International Institute for Sustainable Labs links to on their website (you can view the posters on our website here: http://www.colorado.edu/ecenter/green-labs-outreach-materials/green-labs... [2]).

Implementation Status

As I mentioned earlier, the program was piloted in 2007 and officially began in 2009. Since that time, it has grown and increased in presence and acceptance on campus. The potential impact of the program also continues to grow. For example, some bigger picture ideas to address that will not only benefit conservation through efficient use of equipment and campus space but will also be of benefit to science and university finances include:

Shared Instrumentation Website: A shared instrumentation website would enable CU-Boulder to showcase equipment assets & attract talented researchers, benefit collaboration on campus and between on-campus and off-campus partners (industry & government), and, importantly, help scientists know what existing campus equipment assets are already available for their use, leading to efficient expenditure of grant funding at a time when competition for federal grant funding is on the rise. This database tool would help scientists focus their spending on actual research, which in turn would be expected to be of benefit to research success, publication, and a greater success rate for grant funding. University of California-Santa Barbara has already created such a website (www.sharedinstrumentation.ucsb.edu [3]) and is willing to share the software with other interested campus at no cost.

Surplus Equipment Website: CU-Boulder presently has equipment assets leaving campus that could still be of use to other departments. As a result, researchers and university departments are spending money to purchase equipment that other departments are disposing, resulting in a financial loss to the University. Scientists are often wary to dispose of items that could be of use to another researcher in the future, leading to storage of unneeded equipment and supplies in one of the most expensive spaces on campus to build, labs. ASSETT (Arts & Sciences Support of Education Through Technology) and CU Green Labs, having recognized the need for a surplus equipment website, contacted and received approval from Distribution Center, Property Accounting, EH&S, and CU Legal to move forward with an on-line tool to fill this need. ASSETT has created a first version of the tool that with some further support and development could be used to fulfill this campus need: http://compass.colorado.edu/cuproperty

[4].

Increasing the Availability of Core Lab Equipment Facilities: CU-Boulder has a number of successful core lab equipment facilities for shared equipment on campus, most of which house very specialized, expensive equipment. In the opinion of CU Green Labs, the potential exists for reorganizing space in lab buildings to create more core facilities to also include more common lab equipment. A successful example of a core facility with more common equipment is the CU-Boulder Biochemistry Cell Culture Facility for biosafety cabinet and incubator use. Core facilities benefit scientists by avoiding grant dollar expenditures on duplicate equipment and providing an array of accessible research equipment where the responsibility of training users and maintaining the equipment falls on the facility manager. It also would enable departments to save funding by offering smaller start-up packages to new Principal Investigators because of the reduced need to purchase their “own” equipment.

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Links
[1] https://www.cu.edu/controller/i-e-awards/past-submissions/cusp-cu-ie-submission-green-labs-initiative
[2] http://www.colorado.edu/ecenter/green-labs-outreach-materials/green-labs-posters
[3] http://www.sharedinstrumentation.ucsb.edu [4] http://compass.colorado.edu/cuproperty
[5] mailto:kramirez@colorado.edu