

Green Hoods Completion Report

Spring 2016



Green Hoods Energy Conservation Pilot Project

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Summary

Green Hoods is an effort to reduce fume hood energy waste in a total of 55 fume hoods in Edward R. Madigan Laboratory (ERML) by changing fume hood users' practices, based on Harvard's highly successful Shut the Sash program. Green Hoods' overall end goal is long term: to develop an approach to fume hood energy conservation that can be readily applied to other labs and buildings on campus. Green Hoods uses an advisory board approach involving Associate Dean Neal Merchen, ACES Office of Research, Facilities and Services, ERML's Building Manager, the ICAP Energy Conservation and Building Standards Sustainability Working Advisory Team (SWAT), the Student Sustainability Committee, and others. Project processes including intervention testing, advisory board meetings, focus groups, and advice for overcoming resistance are described in this document. Interventions included building wide scans to collect data of fume hood sash height and creating a local continuous presence.

Over the course of two months, fume hood sash heights improved from 28% closed pre-intervention to 93% closed post-intervention. In the span of the semester, Green Hoods achieved its goal in using ERML to develop an approach to fume hood energy conservation that will be applied to other labs and buildings on campus. Green Hoods will be continued and will potentially be expanded to the Animal Science Building. Other buildings within the College of Agricultural, Consumer, and Environmental Science will also serve as possible candidates to adopt Green Hoods.

Introduction

The purpose of this document is to explain the processes of the Green Hoods Energy Conservation Pilot Project that took place at the University of Illinois at Urbana-Champaign during the Spring 2016 school year semester in Edward R. Madigan Laboratory. The Green Hoods initiative is an effort to reduce fume hood energy waste in a total of 55 fume hoods in ERML by changing fume hood users' practices, based on Harvard's highly successful Shut the Sash program. Green Hoods' overall end goal is long term; this semester-long effort used ERML to develop an approach to fume hood energy conservation that can be readily applied to other labs and buildings on campus.

Inspirational Projects

Green Hoods was modeled off of the Shut the Sash program at Harvard University, which changed lab occupant behaviors to limit energy losses due to unnecessary ventilation in laboratory spaces through fume hoods. To promote closure of the sashes, the Shut the Sash program engaged lab personnel through a combination of audits, informational events, feedback, and friendly competitions with rewards.

Quentin Gilly is the full-time Green Labs Coordinator at Harvard and was an excellent resource throughout the semester. He was happy to skype with a few of the members of the Green Hoods advisory board and gave valuable advice on how to form interventions, market the initiative to participants, and create a local continuous presence.

Project Processes

Green Hoods involved many moving parts and processes that all affected its results. This section explains these processes, how long they took to get together, and how beneficial they were.

Acquiring a Grant

The Student Sustainability Committee approved a grant proposal for the Fume Hoods Energy Conservation Pilot Project. The proposal included a project description, scope, schedule, and budget outline, and an overview of environmental and economic impacts. The approved contract divided the \$1000 grant into equipment costs for meters and current loggers, publicity posters, and general supplies. The grant was approved in February when the project was in the very early stages. Because the Green Hoods Pilot Project was in developmental stages, and ultimately ended up being a low-budget, almost free project, the funds were not used. Green Hoods will continue to develop and expand, and part of its “pilot” nature was proven through the changes in approach throughout the course of the semester.

The grant took approximately three weeks to be approved, and the money took a few months to process until it was available for the project. It is recommended that grants are applied for as early as possible because of the 1-3 months of setback waiting for the grant money after the grant is approved. *In future efforts, it may be necessary to use*

funding to polish project supplies when expanding Green Hoods. Materials such as stickers, signs, and posters can be made more aesthetically appealing and streamlined with a grant, so it is recommended to apply for such grants. Student Sustainability Committee grants are not difficult to apply for and require a proposal, participation at a working group meeting, and compliance with a contract.

Using an Advisory Board Approach

The Green Hoods Project was not only run by the Green Hoods intern and a faculty member sponsoring the project but also involved an advisory board that was highly responsible for its successes. This board included Associate Dean Neal Merchen of the ACES Office of Research, Building Facilities and Services (F & S), Safety and Compliance, the iCAP Energy Conservation and Building Standards Sustainability Working Advisory Team (SWATeam), the Student Sustainability Committee, and many others. Guidance and recommendations from experts of varying perspectives helped to ensure a well-formulated project scope, goals, and plan of execution.

As a Green Hoods intern, much of the work getting the project up and running involved writing proposals to people that would play a role as a team member of Green Hoods. To build an advisory board, I drafted clear, concise letters to explain the initiative and invite each person/group on the advisory board to the team. Each sector of the board required a different appeal, and each person played a unique role. It is important to communicate that message when conversing with them. Altogether, it took about two months to form this advisory board. Though it was time and work intensive to rally a group together, I would highly recommend doing so.

Assistance from F & S and Safety and Compliance was integral to getting access to ERML and acquiring a master key to all the labs. I drafted a letter to be sent from ERML's building manager's email account to announce the Green Hoods project. This way, I was not searching for a small handful of labs willing to participate; rather, I had 55 fume hoods to work with.

The guidance and recommendations from experts of varying perspectives gained from using an advisory board approach helped to ensure a well-formulated project. In future efforts, having a team and working with Building F & S, Safety and Compliance, and an academic advocate (such as a Dean or the Chancellor) in particular, will be the key to creating and fulfilling a successful project.

Project Support from an Academic Advocate

Support of the project from a well-respected academic advocate is recommended. Because labs will be more willing to comply with the project, it was beneficial for Green Hoods to have Associate Dean Neal Merchen of the ACES Office of Research in support of the project. Along with the letter of support from F & S, Dean Merchen approved of his name to be posted along with a simple message that read “Thank you for helping us reach our ICAP objectives!” on materials for the project.

Dean Merchen was quick to reply to messages and agreed to support the project, so he was on board within a week. Some other Deans and Chancellor Barbara Wilson ultimately agreed, but were unresponsive for a few weeks since they are very busy. *It is very beneficial to have an academic advocate on board with a sustainability effort that asks participants to follow guidelines. In future efforts, it is recommended to reach out to the potential academic advocates early, since they may not be able to respond for weeks or may not respond at all.* Choose someone, or even multiple people, who is recognizable and respected, and ask them for something simple, like the approval of a single, straightforward line signed off with their name, and they will be more willing to agree.

Sample letter to Dean Hauser asking for assistance as an academic advocate:

Dear Dean Hauser,

I am writing to request your support for an energy reduction effort in ERML. This semester, Dr. Ming Kuo and I are conducting a Green Hoods Energy Conservation Pilot Project in which we will be exploring ways to reduce fume hood energy waste through behavioral interventions. We are hoping you would be willing to let us include your name on the stickers we place on fume hoods in ERML. The stickers would look something like this:

A gentle reminder to shut the sash when not in use. Thanks for saving energy!

-Green Hoods [date]

Thank you for helping us reach our ICAP objectives!
-Karl Helmink, Facilities & Services
-The Student Sustainability Committee
-Robert Hauser, Dean, College of ACES

Because ERML is the 8th largest consumer of energy on campus and the current annual energy budget for the building is over \$1.3 million, our low cost, large impact project will make a lasting difference. A similar sustainability initiative was done at Harvard in which a 30% reduction in fume hood exhaust levels was achieved, saving over \$240,000 per year. In ERML, this could translate to \$390,000 saved per year. Your support of our Green Hoods Project would be invaluable. If you have any questions or concerns, please let me know.

Thank you,
Olivia Yu, NRES
Dr. Ming Kuo, NRES

Small-Scale Intervention Testing

In the beginning stages of the project, the interventions were to be developed and evaluated in one or two labs; refining them and expanding the initiative to a handful of interested labs later. These few “guinea pig” labs were used to test different interventions to find what worked, what did not, and how best to implement the interventions.

Over the course of two months, I appealed to all labs in ERML, and two labs agreed to serve as “guinea pigs” and worked with Green Hoods to test interventions among their lab personnel. Stickers, cameras, colored placards, time logs, bi-weekly visits, and interviews were used, along with other potential interventions. Though I got some helpful feedback from these efforts, they were not worth the time it took to bring everything together. *It is not imperative to perform small-scale intervention testing in guinea pig labs, especially since Green Hoods’ approach to changing fume hood user behavior has been developed to be applied to entire buildings full of labs, not just a small handful of labs. However, if a similar future effort is parting from Green Hoods’ current path, it will be beneficial to test the project on a small scale to determine the best course of action for the initiative.*

Campus-Wide Advisory Board Meetings

After gathering resources and planning Green Hoods’ goals, timeline, and plan of approach, a meeting was held to discuss the project in detail and explore options that had not yet been considered. There were many people of different divisions involved

in this meeting of over ten people, including F & S, Safety and Compliance, the SWATeam, Communications Department focus group coordinators, Green Hoods intern and the Green Hoods faculty sponsor. It took about a month to set a meeting date and time when everyone was available.

After preparing a two-hour meeting agenda, it was sent to all parties scheduled to attend the meeting along with a request to bring suggestions and feedback. To get everyone on the same page, quickly and effectively, I prepared a thorough overview of the project's short-term and long-term goals and approach.

At the initial meeting on March 4th, 2016, our campus-wide advisory board met to discuss the project and brainstorm ways to increase efficiency and success of the effort. Out of any steps that were taken in this project, this meeting was the most useful and is largely responsible for the project's success. As a result of our meeting's discussion, we proposed to revise the Green Hoods initiative substantially in its target audience, monitoring approach, and intervention approach. Our overall end goal is still long term; that is, this effort used ERML/this semester to develop an approach to fume hood energy conservation that can be readily applied to other labs and buildings on campus. However, the methodology of obtaining our goals changed to a building-wide approach rather than focusing on a small handful of "guinea pig" labs. To create behavioral change throughout the entire building, we relied heavily on a local continuous presence as well as positive reinforcement and rewards.

In continuing Green Hoods or in similar future efforts, it is highly advised to host meetings involving an advisory board in order to share ideas from different viewpoints. Being able to clearly communicate to a room and explain a problem and work to get a solution or feedback is integral to gaining commitment from the board, and therefore increases investment to the project.

Initial Green Hoods meeting agenda:

Meeting Agenda – Fume Hood Energy Conservation Pilot Project
3/14/16

Attendees:

Olivia Yu, NRES, Green Hoods intern

Ming Kuo, NRES, faculty member sponsoring Green Hoods

Marian Huhman, Communications, SWATeam Green Labs

Sam Wilson, Communications

Darren Gentzler, Facilities and Services

Karl Helmink, Facilities and Services

Paul Foote, Facilities and Services

Tom Anderson, Safety and Compliance

Jeremy Neighbors, Safety and Compliance, Shut the Sash 2010

Doug Wolters, Facilities and Services

- Intro Shut the Sash (STS) Harvard
- STS program at the University of Illinois in 2010 - comparison with Harvard's program.
- My plan of implementation of STS in ERML
- What I have found from two guinea pig labs
- Need ideas on other interventions
- Two other labs, one interested, the other we can possibly get on board
- News on receiving grant from SCC - suggestions for reallocation of money (\$1000)
- Dr. Huhman and Sam - update on IRB/focus group
- Help and feedback on my plan going forward

Focus Groups

Focus groups were held by a graduate student in the Communications department. These groups were designed to host conversations with fume hood users to determine the barriers to behavior, using fume hoods properly. From start to finish, the focus groups took about three months. They took an extensive amount of time because of the need to prepare and acquire approval of an IRB package.

Originally, the focus groups were to occur a month previously, and outcomes would be used to help develop interventions. However, because of scheduling setbacks and difficulty recruiting discussion participants, focus groups were held simultaneously with the implementations of interventions in the labs. Despite veering from the original plan, the focus groups were still helpful to the project. The main message participants stressed was a strong need for a local continuous presence throughout the building for the duration of the project. They placed a premium on having a “face” for the project so that someone would be available to explain the effort and answer questions. This local continuous presence in ERML is something that I worked to foster daily, and it made a large impact on the results of the project.

In terms of future efforts, it is not necessary to go through the trouble of organizing an official focus group; rather, visiting labs and asking questions to get feedback on interventions or new project ideas are recommended. If expanding the efforts to other buildings, it is definitely recommended to drop in on labs and have short conversations

with lab personnel regarding the implementation of Green Hoods in their labs and the building as a whole, especially since each building is different in the way it is run, the types of research and experimentation that take place in those labs, and the attitudes of lab personnel working in the building.

Implementations of Interventions

Behavioral change interventions were implemented in ERML three months into the project. The main interventions included bi-weekly ERML-wide scans to collect data of fume hood sash heights, a local continuous presence, and stickers reminding fume hood users to lower sashes when the fume hoods were not in use.

A detailed explanation of sash height scans and creating and maintaining a local continuous presence can be found in “Guide to ERML Lab Scans,” which should be used in conjunction with this completion report.

When expanding Green Hoods, it will be important to form a standardized method of scans within each new building. The methodology of interventions will primarily stay consistent, but each new lab that Green Hoods is expanded to will have specific needs, and it is important to tailor solutions to each lab’s needs.

Sample letter announcing Green Hoods implementation:

Dear ERML Principal Investigators and Lab Personnel,

Over the next few weeks, ERML will be embarking on an effort to reduce fume hood energy waste.

As you may know, the Illinois Climate Action Plan sets ambitious energy savings goals which could place UIUC as one of the leaders nationwide in energy conservation. ERML is the 8th largest consumer of energy on campus and the current annual energy budget for the building is over \$1.3 million. As fume hoods are a major energy use in ERML, it is imperative we find ways to reduce fume hood-related energy waste. This Green Hoods effort is based on a highly successful program at Harvard University and has the potential to save up to \$390,000 in energy annually.

Your participation in this effort is simple. When a hood is not in use, keep it shut. And when it is in use, post an “in use” sticker with a date/time the sash can safely be shut.

Good fume hood energy conservation practices will be celebrated with badges and pizza. Starting today, a Green Hoods intern will be coming around ERML Labs to

provide “in use” stickers, orient you to the program, and answer any questions you may have. We are also happy to address any questions via email at GreenHoodsUIUC@gmail.com. Starting this week, the intern will also be coming around occasionally to check fume hood sash heights and to shut sashes where appropriate; hoods with “in use” stickers will not be disturbed.

Thanks for your efforts to make ERML a campus leader in saving energy and reaching our ICAP goals!

The Green Hoods Energy Conservation Team

Olivia Yu, NRES

Associate Professor Ming Kuo, NRES

Green Hoods gratefully acknowledges with assistance and guidance from Associate Dean Neal Merchen, ACES Office of Research, Karl Helmink, Facilities and Services, Building Manager Darren Gentzler, the ICAP Energy Conservation and Building Standards Sustainability Working Advisory Team (SWAT), the Student Sustainability Committee, and many others.

Other Potential Interventions

T-shirts and badges are a few ideas that did not become part of the project in the Spring semester but have the potential to be useful moving forward.

T-shirts are an appealing option to reward good behavior. They can be delivered in an impromptu manner to labs or raffled off as an incentive. T-shirts hold excellent potential in that they increase visibility campus-wide and further. A downside to t-shirts is that they can be costly, but costs can be covered with grant money if any is awarded.

Badges can be used to reward any good behavior of a lab and are especially beneficial at the beginning of the adoption of Green Hoods into a lab. A reward for any small behavior will quickly enforce that behavior as well as maintain a presence of Green Hoods within the lab. Badges are also completely free, as they can be administered via email and posted on the outside of a lab’s door. Posting on a lab’s door creates a competitiveness between labs which can result in further success in reaching behavior change. Because badges hold accountability and increase the visibility of Green Hoods, they are recommended to be implemented in future Green Hoods efforts. Badges seemed promising in guinea pig labs as well, and in the continuation of this project, badges

would be the first recommendation I would have to implement in ERML or other labs.

Examples of badges and the behaviors that should be rewarded:

- Sun - Keeping sticker/post-its or tape near fume hood
- Fire - Having fume hood shut upon check/scan
- Star - Putting very first sticker up
- Water - Putting “in use” sticker up
- Gneiss - Encouragement of other labs/fostering friendly competition
- Obsidian - Having fume hood sash closed every time Green Hoods has checked
- Moon - Offering feedback to Green Hoods intern
- Earth - Showing great improvement in remembering to shut sash

Overcoming Resistance

It should be noted that certain lab personnel may not care to abide by Green Hoods guidelines. Resistance was apparent in some personnel who articulated that they did not have time to talk during initial meetings, PIs who explained that their fume hood sashes were always closed (which was not the case, as found in scans,) PIs who were uncomfortable with the idea that a student intern was entering their labs unannounced, and PIs who opted not to participate in the project altogether.

Though these cases took place in less than 10% of the labs and were not strong enough to be detrimental to the success of the project, they still stood as a challenge to overcome. *In minimizing resistance for future Green Hoods efforts, an in-person visit to the lab may alleviate some of the stresses for implementing the project in their lab. In as little as five minutes, a positive conversation that dismisses worries for the project and addresses any concerns will go a long way. To address labs that further resist, a message from a building manager or the academic project advocate will help to get the lab on board.*

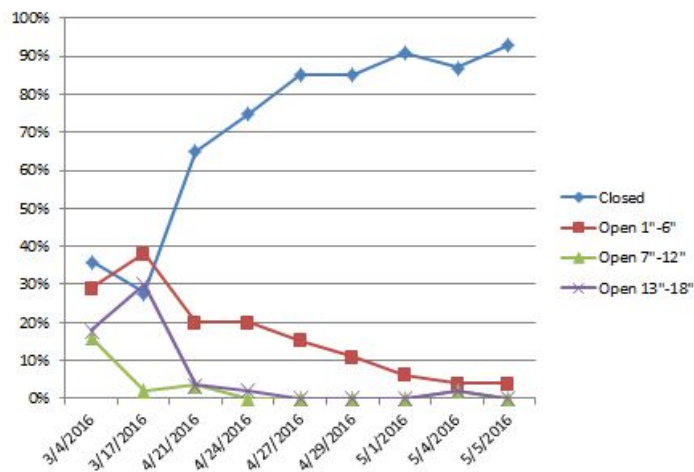
Results

Over the course of two months, fume hood sash heights improved from 28% closed pre-intervention to 93% closed post-intervention. This significant change occurred when interventions had only been in place for three weeks. Green Hoods was successful in

increasing awareness of proper fume hood usage and changing fume hood user behavior to limit unnecessary energy losses. The sash height data improved rapidly and is largely attributed to the building of a local continuous presence. With frequent visits to labs to discuss Green Hoods, lab personnel were much more aware of their fume hood usage and therefore exercised proper usage behavior.

In the span of the semester, Green Hoods achieved its goal in using ERML to develop an approach to fume hood energy conservation that can be readily applied to other labs and buildings on campus.

This graph and table display data of ERML fume hood sash heights, pre- and post-intervention.



Date	Pre-Intervention 3/4 & 3/17		Began Interventions 4/21						
	3/4/2016	3/17/2016	4/21/2016**	4/24/2016*	4/27/2016	4/29/2016*	5/1/2016*	5/4/2016*	5/5/2016*
Closed	36%	28%	65%	75%	85%	85%	91%	87%	93%
Open 1"-6"	29%	38%	20%	20%	15%	11%	6%	4%	4%
Open 7"-12"	16%	2%	4%	0%	0%	0%	0%	2%	0%

* = 2 hoods inaccessible due to locked lab
 ** = 4 hoods inaccessible due to locked labs

Survey

Eight individuals responded to the online GoogleForm survey. Despite the relatively low response, the survey was still helpful in guiding future efforts for Green Hoods. In general, the respondents agreed that Green Hoods was helpful in reminding them to shut their fume hoods sashes. All eight respondents felt that Green Hoods should be

expanded to other buildings on campus.

Three of the eight respondents provided written comments. *Project participants recommended that Green Hoods provides “short and clear messages about the goals of the project.”* It was also noted from participants that the pizza party raffle incentive was helpful and that it should be made clear that a student intern will be periodically entering labs with a master key.

Difficulties in Calculating Savings

Because ERML is 25 years old and relatively outdated in terms of energy saving technology, the building is on a list to be evaluated for a future ESCO (energy saving company) project, which makes it very likely that the building room level lab controls will need to be replaced. If this were to occur, building managers and F & S would have better information, control, and hopefully, energy savings. Because there are many deferred maintenance needs in ERML, it is difficult to interpret energy changes as both actual savings in money or improvements to iCAP goals. *Before ERML has the technological improvements needed to evaluate savings, steps to achieve savings must be kept in mind moving forward. It is helpful to building F & S to take note of fume hoods that are never being used, as these need not be replaced in the event of an ESCO project.*

Moving Forward and Conclusion

In the span of the semester, Green Hoods achieved its goal in using ERML to develop an approach to fume hood energy conservation that can be readily applied to other labs and buildings on campus. Green Hoods achieved its goal of changing fume hood user behavior shown in the increase of 28% fume hoods closed on March 17th to 93% of hoods closed two weeks post-intervention.

In a conclusive Green Hoods Spring semester campus-wide advisory board meeting, it was decided that Green Hoods will be continued and will potentially be expanded to the Animal Science Building. Other buildings within the College of Agricultural, Consumer, and Environmental Science will serve as possible candidates to adopt Green Hoods as well.

Summary of recommendations for moving forward:

- Evaluate fume hoods with no/low usage
- Form a multi-perspective advisory board
- Use a standardized method of scans within each new building

- Create and maintain a strong local continuous presence

List of Key Players who may be interested in continuing Green Hoods:

- Natalie Pelekh, pelekh2@illinois.edu
 - Green Labs undergraduate student intern
- Erica Myers, ecmyers@illinois.edu
 - Agricultural and Consumer Economics (ACE) Professor interested in conducting a sustainability initiative involving energy conservation and behavioral change
- Institute for Sustainability, Energy, and Environment (iSEE) UIUC, sustainability@illinois.edu
 - Potential for iSEE to fund a full-time position

Other materials

The “Guide to ERML Lab Scans” should be used in conjunction with this completion report.