Action Research Team
Green Living Project: Energy Team
University of California, Los Angeles

Education for Sustainable Living Program (ESLP)

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Abstract

The energy team – a component of the Green Living Project – achieved the goal of measuring, categorizing, and understanding the energy usage habits of UCLA's on-campus residents. Over the last twenty weeks, the team performed a two-fold data collection process on undergraduates living in on-campus housing. Directly, team members used Kill-A-Watt energy meters to monitor volunteer student energy use for weeklong periods. Total results showed that students use on average just over 5 kilowatt-hours (kWh) of energy each week, with over 90% of students using less than 12 kWh. The team also collected information on student knowledge regarding energy conservation and on the particular appliances used by volunteers during their weeklong period. The group found, for example, that students frequently did not use the power strips they owned properly and that the use of a microfridge in a room more than doubled a student's energy use average over a week.

The energy team also performed a residence-wide survey, encompassing 816 students. Providing a broader look toward student energy use, the survey posed questions about whether students turned off their lights, what appliances they used, their knowledge of power strips and compact fluorescent light bulbs (CFLs), and time spent in their rooms. Survey responses correlated quite well with metering data from selected volunteers, and the energy team discovered that students frequently left their lights on and used their air conditioning (when available) almost constantly. The team also delved into other aspects of research, including reminder stickers and am energy-monitoring website similar to that used at Oberlin College. The team recommends that Housing consider a similar website, continue educational outreach, purchase reminder stickers, institute a SmartStrip rent program similar to that used for wireless technology, and perhaps switch microfridge vendors to a more sustainable supplier.

Acknowledgements

We would like to thank ESLP, the UCLA Institute of the Environment, our academic advisors, Carl Maida and Cully Nordby, and our stakeholders, Robert Gilbert and Rob Kadota for their support and advice. We would also like to thank UCLA Facilities and Robert Hall for providing us with the Kill-A-Watt meters as well as Youth Venture for the grant to fund the project. Additionally, our project would not have been successful without support from the Dykstra, De Neve and Rieber Terrace student leader associations as well as all of our metering and survey participants.

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Introduction

With a growing concern about how our daily habits can have a large impact on our current resources and the environment, the Green Living Project was initiated to find practical ways for all students to reduce their environmental impacts. As one of the three Action Research Teams of this project, the Energy team sought to better understand students' energy usage habits. With this understanding, the Energy team could then develop solutions that would require simple behavioral changes from on-campus residents, as well as simple resources provided by on-campus Housing/ORL. Therefore, we primarily sought to answer two questions:

1. What common student habits can we target to encourage energy conservation?
2. What can UCLA Housing do to help and encourage residents to use less energy?

Background

Many interested groups have monitored their energy usage and featured their results online. The easy data access enables the participants to reduce their energy consumption. For example, Oberlin College has set up a Campus Resource Monitoring System for every dorm on their campus (1). This website includes many features which track and monitor the energy consumed in real-time. It is also interactive and allows users to see the energy usage of each dorm based on several factors, such as carbon footprint, comparisons to other dorms, and in dollar amounts. Such a website would be a useful tool for UCLA residents, especially for interdorm sustainability competitions. In that regard, it can potentially encourage more students to participate since they will actually know what their impact is.

Taking advantage of the popular website Twitter, where users micro-blog on where they are and what they are doing at any given time, several users have creatively hooked up the system to their homes to monitor their energy usage. One user, Andy Standford-Clark, has

connected sensors in his home to send energy consumption data to his Twitter page as well as allow him to remotely turn lights on or off (2). The idea is that by making energy usage data transparent and easy to understand, it will hopefully change consumer behavior and reduce energy consumption. Similarly, another user has set up her Twitter account to wirelessly receive the amount of kWh consumed from a Kill-A-Watt meter, an energy-monitoring device that we also used to monitor energy use in the dorms (3). Such a system can be easily set up and is inexpensive, as indicated by the "tweetawatt" user who also provides information on how to wirelessly connect the Kill-A-Watt to a computer (4). For a project like ours, it would be handy to make use of Twitter like these users have because it would allow us to easily acquire real-time data and track any changes. Since many people use Twitter today, it should attract participants to check their own and/or their friends' energy consumption and, thereby, encourage a decrease in consumption due to peer pressure or competition.

Additionally, the "Smart Energy Monitoring Pilot Project" (5) has been instigated in the Cape Cod area by Cape Light Compact. They have installed whole-home energy monitors that wirelessly send energy consumption data in real time to computers that then analyze the data and show the amount of energy being used, how much it costs, and what could be done to use less energy in the home. This information can be quite useful in showing students as well as Housing how much energy is being used in real time, and then what changes could be made to students' behavior so that they could use less energy.

Other than just monitoring energy consumption, MIT has also established an initiative t fund and support projects that will help them decrease their overall carbon footprint (6). Established in 2006, the MIT Energy Initiative (MITEI) supports various projects and components such as competitions, coalitions of student groups aiming to support student

projects, publicity and recruitment booklets, campaigns for awareness, metering (like us) to provide information about how much and for what purpose energy is consumed within each building, and a prototype map that displays energy use intensity in various buildings. In their Revolving Door Campaign of a couple years ago, the Initiative created signs reading "Help Conserve Energy, Please Use the Revolving Door". These signs boosted revolving door use to 65% from 23%. The use of two revolving doors at one building was estimated to save almost $7500 in natural gas amounting to nearly 15 tons of CO2 (7). Such an initiative that encompasses multiple projects seemed to effectively increase awareness and student involvement. Although our project is much smaller than MIT's, it will hopefully result in increased awareness and efforts.

Research Methods

In order to determine how we can effectively encourage energy conservation, we sought to understand how much energy students were consuming while living on campus as well as common habits and attitudes towards energy consumption. Therefore we monitored individual students to see how much they are currently using as well as conducted an online survey about usage habits. Research techniques for each method are as follows:

Room Monitoring:

- Method: Kill-A-Watt, meter that recorded kWh for an entire week
- Locations: Even floors of Rieber Terrace, Rieber Vista, De Neve, Hedrick Hall, Hedrick Summit, Sproul Hall, and Dykstra Hall,
- Sampling:
  - Convenient i.e. random students who agreed to be monitored
  - Total: 69 participants
  - All participants signed a consent form (included in the Appendix)
- Rotated monitors on a weekly basis
- Provided participants with power strips if they did not own one in order to record their total energy consumption as accurately as possible
- Exit survey included the following information:
  - Gender, Building, Room #, Year
  - All items plugged into the meter

- Do they have a microwave/refridgerator?
- If they use a desk lamp, what type of bulb do they use? (incandescent/CFL/halogen)
- Were they conscious of the meter? Did it affect their normal behavior?
- What would help them use less energy?

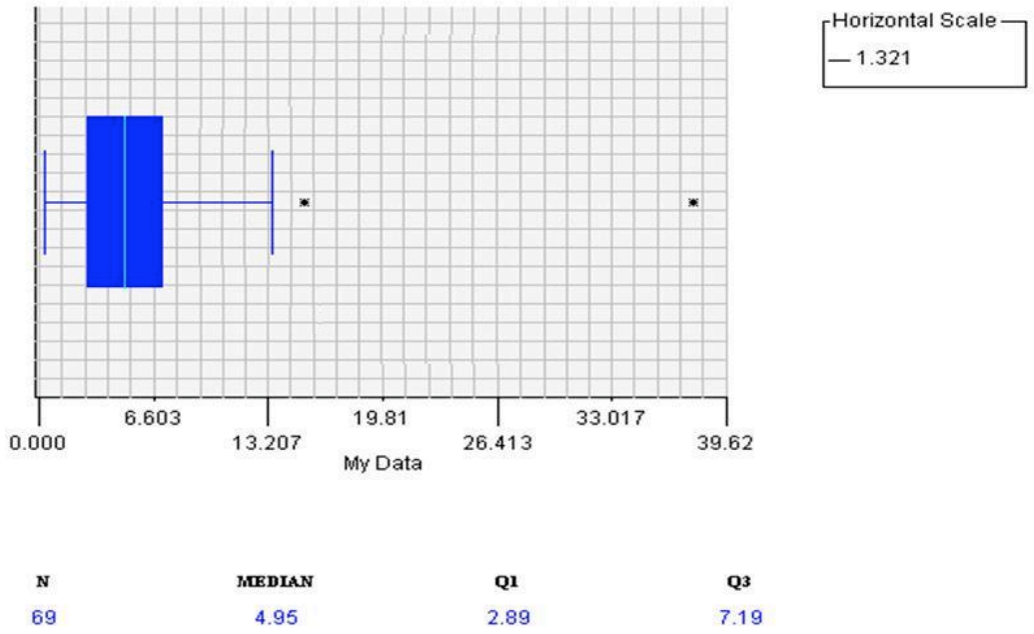
Online Survey:

- Method: Online survey at surveymonkey.com
- Locations: Rieber Terrace and Dykstra lobbies, De Neve and Covel dining halls
- Sampling: Convenient i.e. random students who agreed to take the survey
- Conducted survey between 5-8PM, the times we believed there would be most traffic due to the dinner rush
- Sample of survey questions provided in the Appendix

Data/Results

Metering Data

In order to determine how much energy an average resident uses and where the major sources of their consumption lies, we monitored individual students in several residential halls and plazas. To achieve as much accuracy as possible in the recorded kWh, we encouraged the participants to plug every electronic device into the power strip that the Kill-A-Watt was monitoring. Additionally, we conducted an exit survey to help us determine what can be targeted to help students consume less energy.



With outlier		Without outlier	
Min:	**0.34**	**Min:**	**0.34**
1st Quartile (Q1)	**2.89**	**1st Quartile (Q1)**	**2.88**
Median (M):	**4.95**	**Median (M):**	**4.875**
3rd Quartile (Q3)	**7.19**	**3rd Quartile (Q3)**	**7.175**
Max (w/o outlier)	**37.77**	**Max (w/o outlier)**	**14.87**
Max:	**37.77**	**Max:**	**14.87**
Mean (x):	**5.663043**	**Mean (x):**	**5.190882**
Standard Deviation:	**4.989689**	**Standard Deviation:**	**3.107477**
Variance:	**24.897**	**Variance:**	**9.656411**

Figure 1. *Box and whisker plot of metering data collected from 69 participants who were monitored for one week (168 hours). The average kWh used by an average student in one week is approximately 5 kWh.*

The majority of students used between 2.8 and 7.2 kWh for the weeklong period. We observed two high end outliers at 14.87 and 37.77. We cannot account for the high of 37.77 kWh. While theoretically it is possible to find such usage in one week, statistically it is highly unlikely that such usage regularly occurs. We can account for the minimums being so low in various ways: students do not always use their rooms for much more than sleeping, it was often hard if not entirely unfeasible to monitor fridge/microwave setups in any given room due to a lack of available equipment, and sometimes students just had few regularly-used items plugged in to their electrical sockets.

While it is somewhat hard to make statistical generalizations due to the low number of data points, sixty-nine week long metering periods is a start and begins to shed light on the issue. The mean with the high outlier is 5.66, without the high outlier 5.19, the median 4.95 and 4.875 respectively. This suggests the projection that the average resident uses 5 kWh per week. KWh data was normalized to an approximate 168-hour period or as close to an exact week as possible. This leads us to conclude that one possible drawback to the monitoring system used by this project is the inability to set a timer to monitor the exact same length of time for each data point. Also interestingly, the standard deviation of the valid data is only 3.11 KWH. Using this sample as a projection, if the data were to hold for the entire Hill, normalized statistics would suggest that 97.8% of students use less than 12 kWh per week, and 84.2% use less than 9 kWh per week. In order of highest to lowest frequency: cell phone chargers, laptops, clocks, printers, desk lamps, fridge/microwave/micro-fridge, and iPod chargers are the most common items plugged into the outlets provided by this pool of participants. This leads to another possible

point of invalidation in total kWh usage: it was often simply not feasible to plug in microwaves/fridges/combos on top of all the other accessories into one power strip per person in a room. Variance between kWh used may also result from differences in microwave and refrigerator models, which was not taken into account by the exit survey since we only noted whether they had those appliances or not. From this information, UCLA may possibly consider regulating and mandating specific micro-fridge or refrigerator models to ensure that these appliances are efficient and cost-effective.

As part of the exit survey we sought to determine what type of light bulbs were used, if participants were meter conscious, and what can be done to help them be more energy efficient. Because the use of CFLs is one of the easiest ways to reduce energy consumption, we also recorded whether residents used CFLs with their personal lamps. Of the 31 respondents, 24 used incandescent light bulbs. Because funding may be an issue for an actual exchange, an information campaign on the benefits to both students' wallets and the environment with the use of CFLs can still be just as effective since residents will understand why making this small investment can be beneficial in the long run.

To eliminate any biased results, we also noted whether participants were conscious of the meter and possibly tried to change their normal behavior in the exit survey. Interestingly, only one of the approximately thirty respondents admitted that they were conscious and made an effort to use less energy. Despite this fact, their meter scored within one standard deviation of the mean usage so their consciousness did not have an impact on the overall results.
The most common suggestion from students on how they can consume less energy were to provide them with multiple, large "off" reminders situated close to doors and light switches. Some also believe peer pressure, economic incentives, and fun facts would also help. These

results suggest that students are willing to change, but they need education and reminders to help instill good habits. A door insert like the emergency plan with a large reminder to turn off lights or unplug unused electronics with, perhaps, a fun fact about the impact should help more residents conserve and be more mindful of their actions.

Survey Data

In order to determine what simple behavioral changes residents can make, we conducted an online survey that focused on energy usage habits. Because the survey was conducted mainly in Rieber Terrace and Dykstra lobbies, and De Neve dining hall, the majority of the respondents reside in these three residence halls. We received a total of 823 surveys, with approximately 99% of students completing all relevant questions in the survey. Females were more willing to complete the survey than males were, by a ratio of approximately 62% to 38%. Additionally, residents who were returning to their residence or leaving the dining halls were more willing to fill out the survey. Survey questions focused on things like what kinds of appliances residents use, how much time they spend in their rooms, how often they turn off their lights, and, particularly for suite/plaza residents, their usage of the air conditioner/heater and bathroom lighting habits.

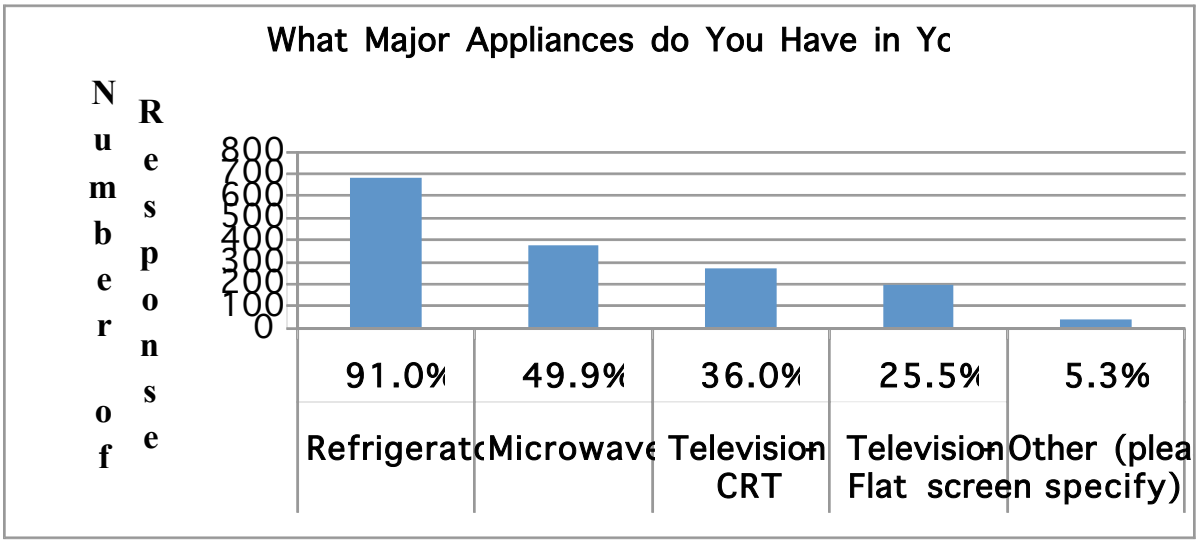


Figure 2a. *Since major appliances draw a lot of energy, we sought to determine how many students actually owned them. As shown, 91% of students surveyed have a fridge, 50% have a microwave, and 62% have a TV. "Other" responses mainly consist of computers (notebook/desktop), gaming systems and sound systems.*

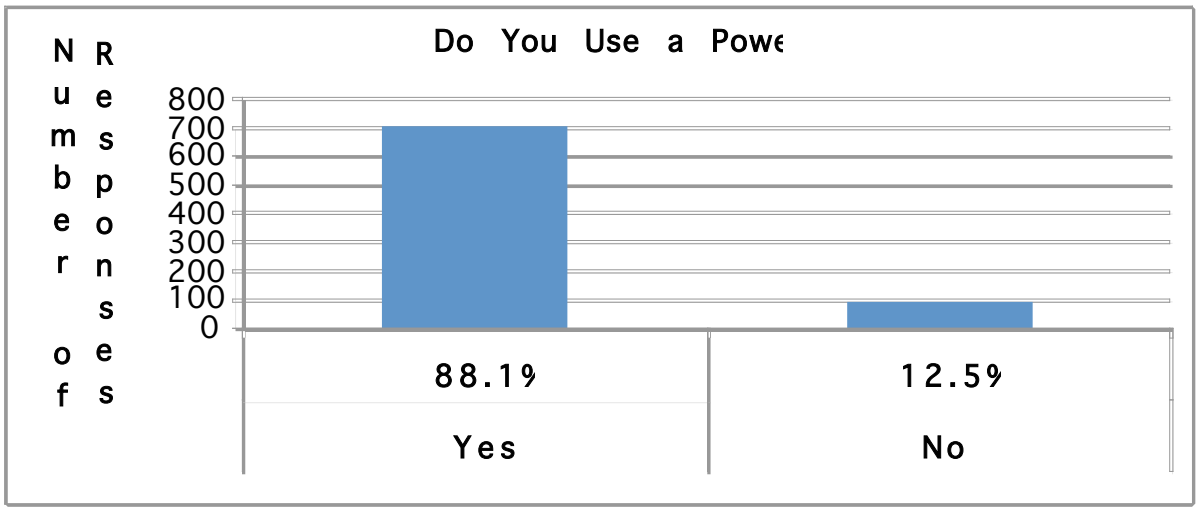


Figure 2b. *This graph shows that a majority of students do use a power strip for their electronics and appliances.*

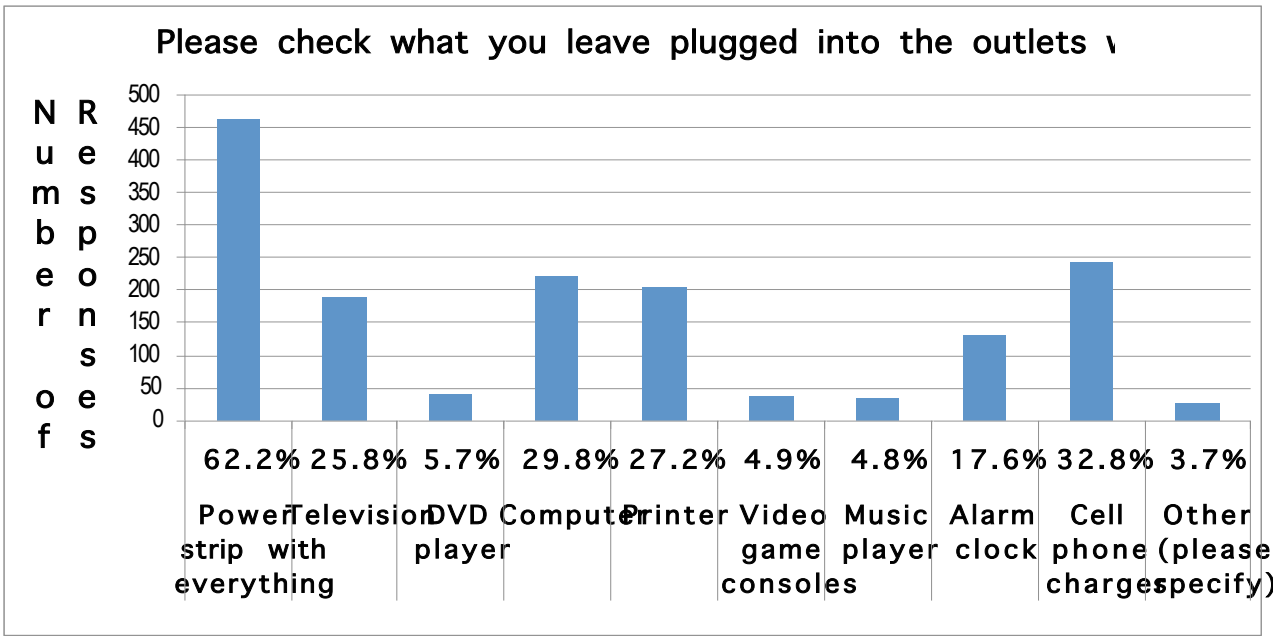


Figure 2c. *This displays common items found in the dorm room and how often these devices are left plugged in while not in use. The most revealing thing about this graph is that the vast majority of students surveyed do use a power strip, and most of them leave everything plugged in, even when they are not using any of the devices. "Other" responses mainly included desk lamps.*

Since major appliances draw a lot of energy, we sought to determine how many students actually owned them. It was found that almost all students have a mini fridge, microwave, or both and that the most common devices plugged into a power strip are: notebook computers, cell phone chargers, printers, fridges, and TVs. Since students do not spend much time in their rooms, they actually do not use their electronics very often. Most students do not watch television every day and 36% more watch just 1-2 hours a day. However, most devices are still left plugged in as shown in Fig. 2c. We also found that even though most students use a power strip, they do not know what the term "power strip" actually refers to. This suggests that students probably need more information about how much energy is still drawn from items on standby as well as how to use a power strip or Smart Strip to reduce energy from items on standby.

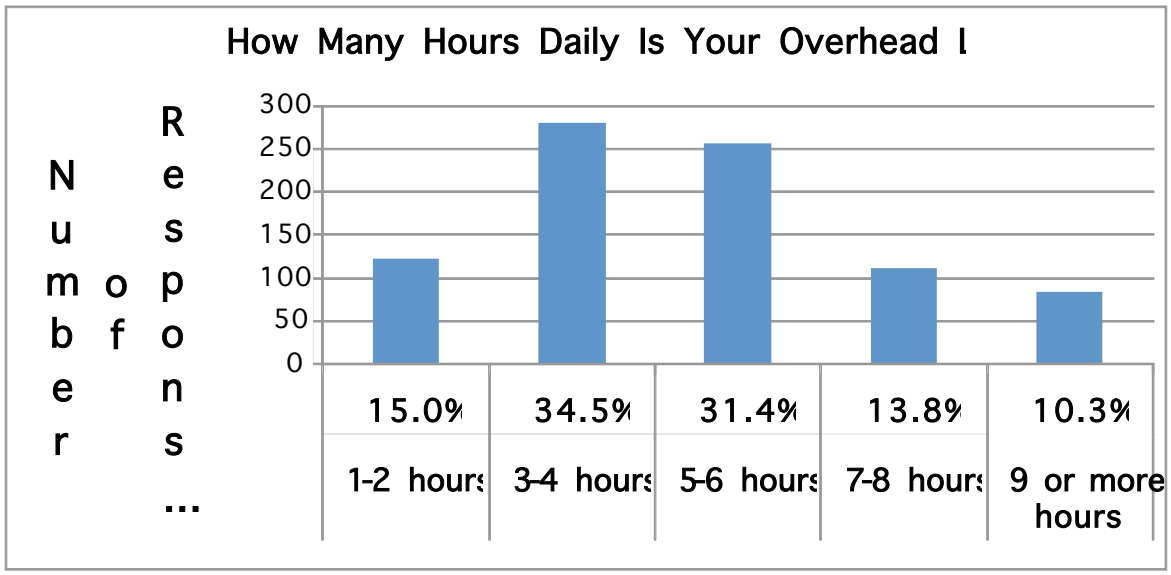


Figure 3a. *This figure displays how often the surveyed students leave the over head light on. Most students use their lights for 3-6 hours a day. This set of data contains some inaccuracy since some respondents took into account their roommates habits while others only accounted for themselves.*

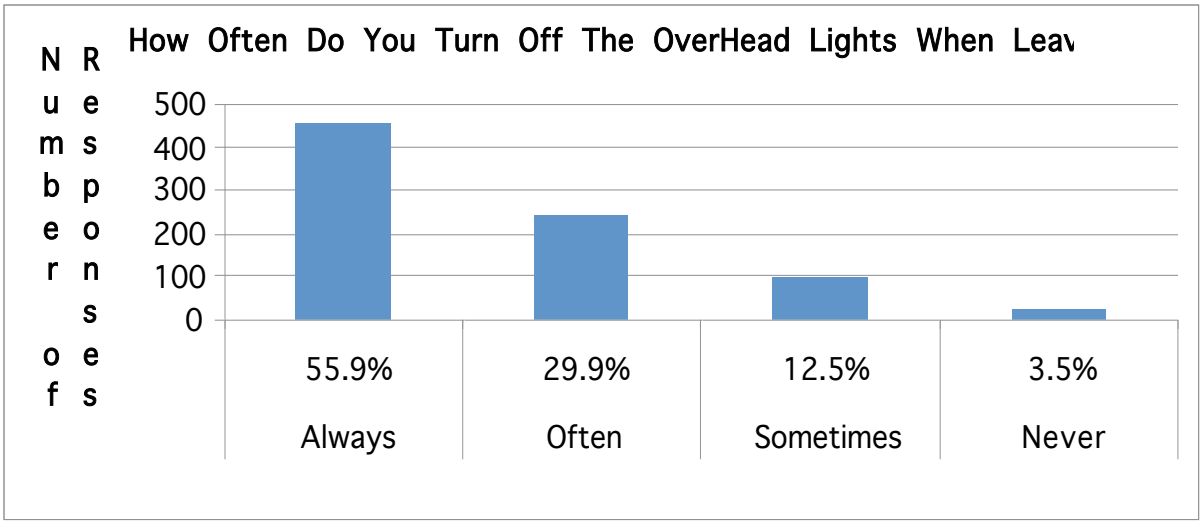


Figure 3b. *This figure shows how often students turn off their lights when they are not in the room. This table tells us that while 56% always turn off the light, while 44% of occasionally or never turn off their lights. Possible inaccuracy arises from students not wanting to show that they waste energy.*

The survey was also very insightful into students' habits regarding the lighting in their rooms. We found that every day, 40% of respondents spend three to four hours—not including sleeping time—in their room, followed closely by 36% who spend five to six hours in their room. Most people also use their overhead light for about the same amounts of time. Even though more than half of the respondents usually turn their lights off when they leave the room, 44% of students still leave them on. Whether they are in a rush, forget, or just do not care, this demonstrates that a significant amount of students need to be reminded or encouraged to turn off their lights. Lighting in common areas, such as the bathroom and study lounge, are also left on

most of the time. Additionally, of the students who have a desk lamp, most use it for 1-2 hours a day and do not use it simultaneously with the overheard light. The majority of respondents never visit the study lounge, and if they do so, most students tend to spend just one or two hours a day there. Although these common habits do not equate to wasting a significant amount of energy, small changes in individual and group habits could reduce the amount that is unnecessarily wasted and will make a huge difference if everyone contributed.

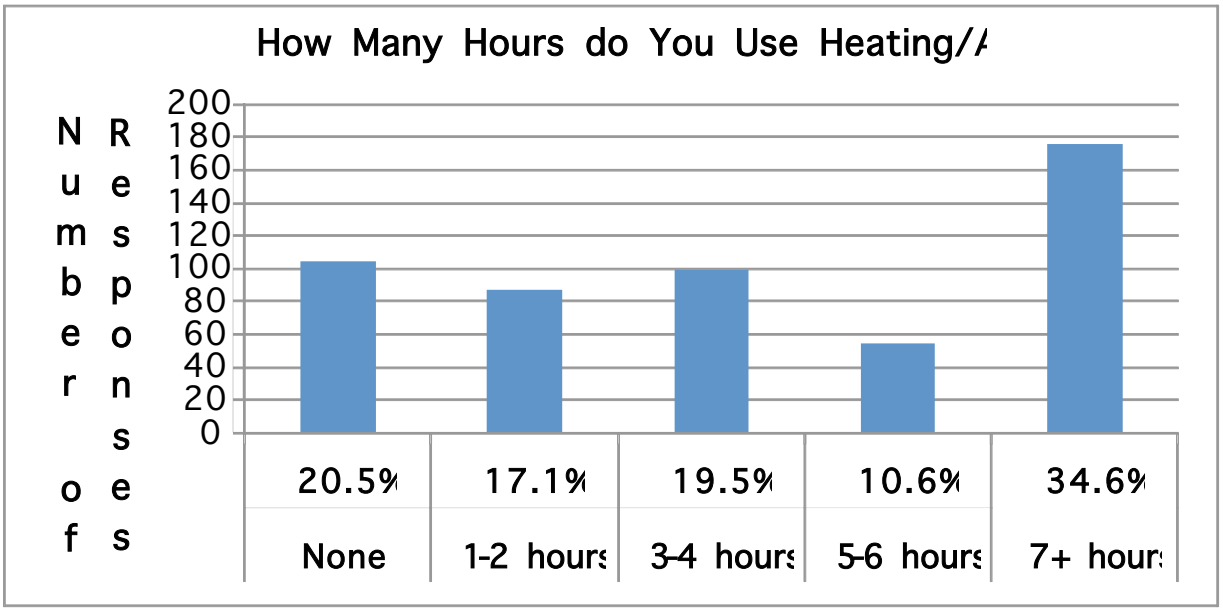


Figure 4a. *This figure displays how often students use their daily usage of the air conditioner or heater. We found that most students use heating or air conditioning at least 7 hours a day. However, these results may have derived from unintentional usage since many students mentioned that their air conditioner turns on throughout the day no matter how high they turn their thermostat.*

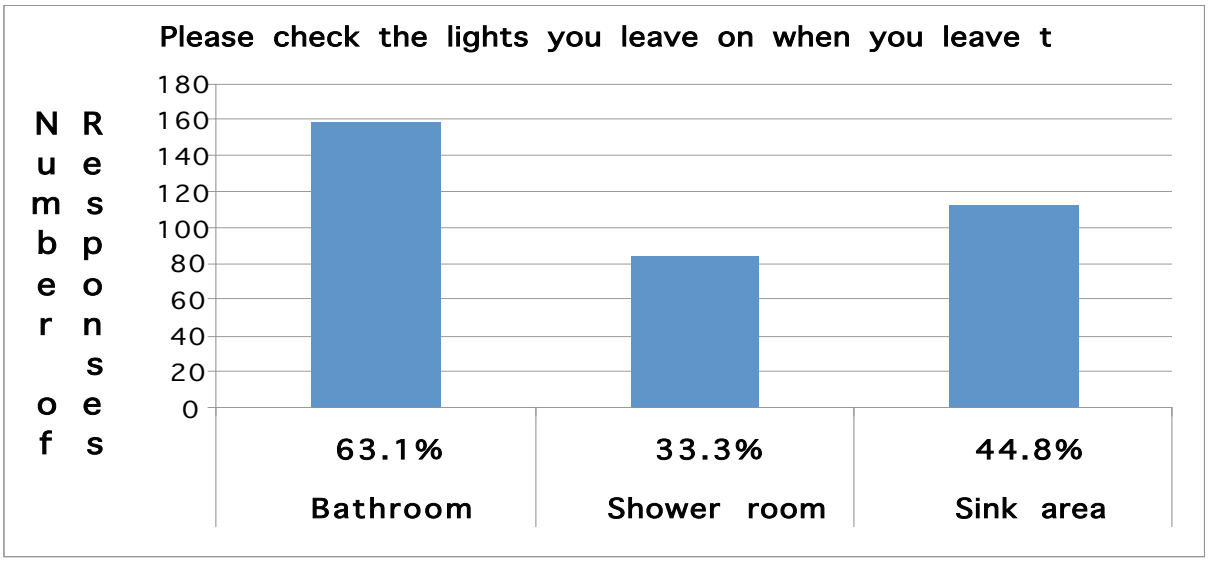


Figure 4b. *This figure shows how often each set of lights within the bathroom is left on. About 60% of students said they leave the bathroom lights on, 45% leave the sink lights on, and 33% leave the shower lights on. The most valuable thing learned from this graph is that most all of the lights in the bathroom are left on for most of the day.*

Our survey also provided insight about the students living in residential suites and plazas. Since the students living in this type of housing have their own bathrooms, smaller study lounges, and heating/air conditioning, they have more control over their living area. We thought it would be interesting to see how their living habits compared to those living in the residential halls. The surveys showed their habits to be about the same; a significant amount of students do not turn off the lights when the rooms are empty. Some or all lights of the bath including the bathroom, shower room and sink area, are left on when not in use. In addition, most students use the air conditioner or heater daily, and the majority uses it seven or more hours a week with an average temperature setting of 72˚F.

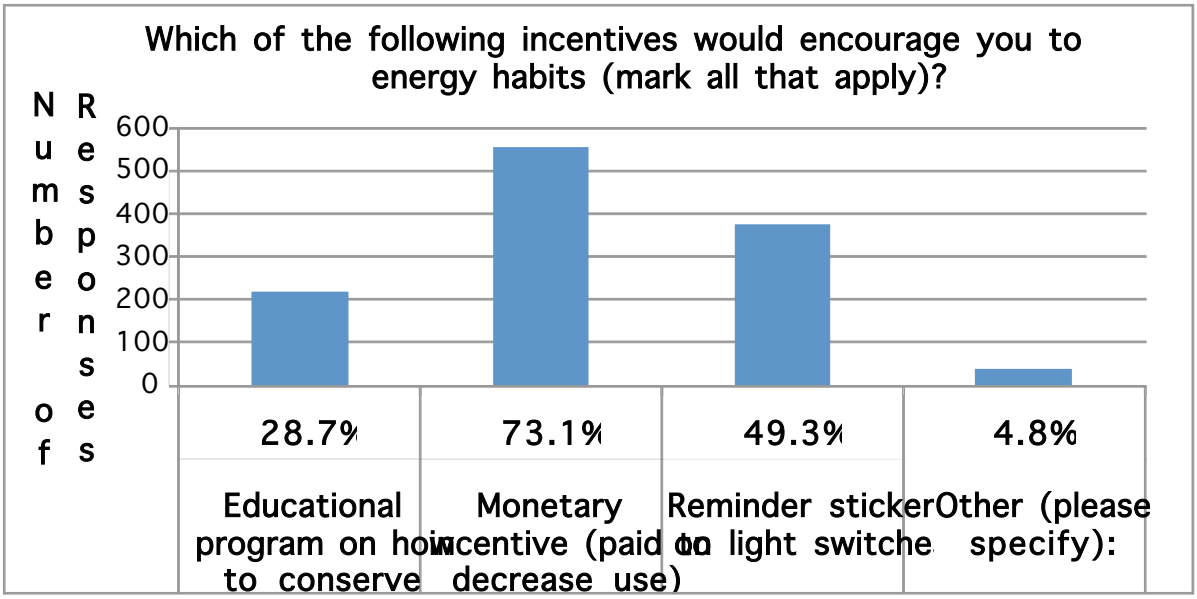


Figure 5. *This figure shows which incentives would encourage students to alter their energy habits. "Other" responses mostly includes rewards (ex. food), awareness of impact, competitions.*

While most students agree that a monetary incentive would change their behavior, about half of the respondents also suggested that educational programs and reminders would help them conserve energy as well. Many students are also interested in reducing their energy consumption for the sake of being more sustainable, so we should try a combination of these incentives to attract more students.

Recommendations

As part of the objectives of this research project preliminary research has been done to help provide some suggestions in ways to achieve energy reductions and some needed steps to achieve these goals. These suggestions were developed from analyzing the survey and monitoring data, researching conservation strategies applicable to dorm lifestyle, and researching background information and studies on electricity usage.

One area of energy conservation that has significant potential with a wide range of options to reduce consumption comes from overhead lighting. Again, question 9 from the survey shows a significant portion of students (44.1%) do not always turn off their lights when they leave their rooms. There are several suggestions to help increase the number of student who turn of their lights when they leave the room. The most cost-effective one is to provide light-switch stickers that can be put on the cover plate of light-switches with reminders to turn lights off when they leave a room. This can be applied to overhead lights as well as bathrooms for plaza and suite buildings, where 63.1% of students who participated in the survey and lived in those types of dorms said they leave the bathroom light on. There is considerable support for this as several Universities and organizations have already implemented this or promoted these on campus, for example the University of Illinois at Champagne/Urbana has stickers reminding students to turn off lights in all dorm rooms. Additionally, numerous student groups and university facilities departments promote these as cost effective methods. A study, jointly published by Institute for Research in Construction, National Research Council of Canada, Department of Psychology at Carleton University and The Rose Technology Group, *The effectiveness of light switch reminders in reducing light usage,* did a controlled field study in four office buildings to determine if light switch plates reduce energy consumption from lighting in private offices (8). The study concluded that, people generally find light-switch reminders to be helpful, with a majority (62%) liking the idea of having a reminder. It also concluded that light-switch reminders need not be installed at every location to have an effect on the entire participating population and finally that the payback period for the chosen locations was approximately 10 weeks at a rate of $0.04 kW h-1 if each cover/sticker costs $1. To achieve the implementation of light-switch stickers, additional research to find an appropriate provider is needed along with

contacting facilities and applying stickers for the upcoming year. Student response to this idea seemed fairly positive, with 49.3% of respondents saying that a reminder would encourage them to turn off their lights. This data may be biased however, because of the alternative option of "monetary incentive" being provided with students preferring this over any other option even if it is not necessarily realistic.

Another option to reduce overhead lighting use, for specifically the bathrooms, is to use motion sensors that will automatically turn off bathrooms lights. This option is more costly both in terms of equipment and installation; however the University already has experience with these devices as they are installed in lounges, recycling and trash rooms and in some classrooms and offices on campus. It has been found that sensors can be installed for between $20 and $40 per installation and, in well under 500 kWh of savings, the sensor will basically pay for itself in the long run since the sensors can last for years (9). However, additional research would be needed to assess the economic feasibility of this and additional surveys would also be needed to gauge student reaction to such a proposed change.

The final suggestion for overhead light is to install key-card slots to activate the overhead lights. These devices are commonly present in hotels outside of the U.S. and are slowly becoming more popular inside the United States; however the feasibility of such devices at UCLA would require extensive research on the installation and maintenance costs, benefits in energy conservation and surveying to gauge student response. Due to these numerous challenges and potential expensive initial investment with a long payback period we recommend pursuing light-switch stickers/covers and motion sensors placed in the bathroom first.

Another area for potential energy reduction is in AC/Heating use in plazas and suites. A significant portion of students (34.6%) use AC/Heating for over seven hours per day. It is

unknown whether students are present in the room at the time of use or not, though if not a reminder to turn off heating and cooling or set temperatures between 72-76 degrees when leaving the room could help reduce energy usage. Again, there is a lack of data on when exactly this AC/Heating usage would occur and further surveying of students and analysis of facilities data for peak usage patterns could be useful, however if the costs are significantly low enough it may be useful to implement a reminder sticker, note or educational pamphlet anyways. Additionally, routine check-ups of the thermostat for proper functioning can prevent unintentional use of the AC/Heating since many survey respondents indicated that their AC turns on no matter how high they turn the thermostat.

Another source of wasted energy comes from electronic devices drawing power when not in use. About a third of students leave cell phone chargers plugged in, which continuously draw energy even if not in use, along with 25.8% leaving televisions plugged in and 29.8% leaving computers and 27.2% leaving printers plugged into power strips when not in use. All of these electronics can passively draw power when not in active use and is preventable, especially if all plugged into one power strip, by simply cutting power to the power strip. Getting students to do turn off the power strip could be achieved with two potential methods. One method would be to start a Smart Strip, or power strip that has a cutoff switch, loan program for students. Survey results indicated that 88.1% of students use a power strip, thus there is both potential to replace power strips that cannot be switched off and additionally reach out to students who may benefit from having a power strip. One issue is a lack of research, though our survey indicates the majority of students use a power strip, it does not indicate what percentage of students have a Smart Strip, or of the students who do have this type of power strip, what percentage actually switch it off. Considering this, it may be most effective to combine a loan program with an

education program designed to promote awareness about devices passively leaching power. This education could be achieved through, information and tips included in the Move-In week handouts, a continuation of RA programming in lounges, and also a permanent sustainability tip sheet on the door of students below the fire escape plan (sample provided in the Appendix). Again 49.3% of students in the survey indicated that that a light-switch reminder would be helpful, and though there is no explicit data on power strip reminders, it could potentially be just as well received. Additionally, though only 28.7% of students felt that an education program would be helpful, this data may be biased as students have traditionally been exposed to floor wide competitions, and RA programming as forms of education and therefore may not think of an educational program being included in their dorm space. Further student surveying may be needed, along with an analysis if this type of education is financially possible.

Finally the last area we identified for energy conservation improvement is with the extensive use of micro-fridges in dorms. Our survey indicated that 91.0% of participants had a refrigerator in their room, meaning any improvement in the average efficiency of micro-fridges could have extensive energy savings. This increase in achieved could be achieved by updating the stock of micro-fridges rented to students by the University. To pursue this additional research is needed, as we currently do not have information on what percentage of students rent micro-fridges from the University nor the overall average efficiency of the average student micro-fridge. This data would also be more difficult to obtain as most students would not know the power usage of their micro-fridge and a new method of surveying would be needed. Again, the economic feasibility would require extensive research to ensure there is an appropriate payback period.

In conclusion, after looking at survey and monitoring data as well as doing outside research on conservation techniques we have provided various suggestions focus on energy conservation through reducing overhead light usage, reducing power lost to appliances that leach energy when not in use, and using a variety of educational strategies along with visual reminders to make students more aware of their energy consumption. The primary challenge to achieving these strategies is a lack of information concerning financial burdens of these strategies and also data on student behavior to help determine cost-benefit of these strategies as well as student receptiveness. Despite these challenges, there are several low cost strategies that have demonstrated their effectiveness and currently what is needed is to explore funding options and the logistics of potential implementation. It is worthwhile to note that a potential source of funding for these projects could come from The Green Initiative Fund (TGIF,) and we encourage the continued student, staff and faculty participation of the Action Research Team.

Additional Research

Based on the Oberlin College monitoring website as well as their studies on the effectiveness of such a program, it would be beneficial for UCLA to invest in such a online-based monitoring program as well. In addition to making it easier to track the energy usage of each dorm building on campus, an interactive website could make students more interested in saving energy. The Oberlin College website got about 4.8 hits per student in dorm buildings with the most up-to-date information online. This is about twice the hits per resident from buildings without "high-resolution" data that the other buildings had (10).

Annual competitions in the dorms to save energy could further serve to promote conservation, and making the website fun and interactive would allow these competitions to go on as smoothly as possible. According to the Oberlin College website, as a result of the energy

competition that the school held in the dorm buildings, there was a 32% reduction in the amount of energy used by residents during the two-week competition (10). They also projected that in a regular setting without a competition, they should still be able to achieve 5% savings per year in utility costs based on altered behavior alone. Therefore, installation of the monitoring equipment, which costs $10.000 per building, should pay for itself in less than 8 years (11). This information demonstrates that such a cost-effective online monitoring system at UCLA can potentially spark more interest to get more participants in energy competitions as well as effectively reduce energy usage. Residents will hopefully continue to make behavioral changes that go beyond the competition period. An interactive website with real-time metering data and cost analysis can also serve as a bill, showing students how much their consumption is costing them as well as their overall impact on the environment. The incentive, then, will be to save money while also saving the planet.

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Appendix

A1. Metering Consent Form

ESLP Action Research Team
Energy Use Study Consent Form
Winter 2009

Contact: Kathy Tran (310) 689-9384 kaytee1387@gmail.com
Ryan Mullen (925) 324-2081 rymullen@gmail.com

Scope of study:

This study is designed to gather information about student energy use in the on-campus residence halls. Our objective is to acquire an average of student energy consumption by monitoring power outlets and light fixtures. We will also perform informational surveys, all done so as to promote sustainability in the daily lives of residents. It will include very little involvement on the part of the subjects. We will monitor power outlet and light fixture use in the following manners:

-Power outlets:

Team members will install a *Kill-A-Watt* socket meter into each of the three power outlets in subjects' room. Subjects will then plug in their own appliances normally, and leave them plugged in for the duration of the experiment (unless you normally unplug these appliances for a period of time). Subjects will not tamper with the *Kill-A-Watt* and agree to behave/use appliances *as they normally would*.

-Light fixtures:

Team members will install a *HOBO* light meter at a predetermined spot in subjects' room. This meter will record on/off variations of the main light fixture. Subjects will not tamper with the *HOBO* and agree to behave/use the lights *as they normally would*.

Disclaimer:

By signing below, the participants voluntarily agree to the monitoring procedures described above, with the understanding that the participants' names and any other identifying information will remain completely anonymous and confidential. Participants also agree to use lights and appliances in exactly the same way as they would normally, as well as maintain and return the *Kill-A-Watt and HOBO* meters in good condition. Finally, the participants may choose to opt out of the program at any time.

I agree to these terms:

Please Print Name	*Signature*	*Date*
Please Print Name	*Signature*	*Date*
Please Print Name	*Signature*	*Date*

A2. Energy Survey

Energy Use Survey

This is a survey to determine the knowledge and attitudes of students living on campus about energy use. Please circle each answer clearly. Your results in this survey will remain completely anonymous. This survey is performed through the Education for Sustainable Living Program. For any questions or comments, please email kaytee1387@gmail.com.

1. *Gender*
   Male Female

2. *What year are you in school?*
   1st 2nd 3rd 4th 5th or more

3. *What building do you live in?*

   _____

4. *On average, how many hours do you spend in your room daily (not including sleeping)?*
   - **a.** None
   - **b.** 1-2 hours
   - **c.** 3-4 hours
   - **d.** 5-6 hours
   - **e.** 7 or more hours

5. *On average, how many hours is your overhead light turned on?*
   - **a.** 1-2 hours
   - **b.** 3-4 hours
   - **c.** 5-6 hours
   - **d.** 7-8 hours
   - **e.** 9 or more hours

6. *On average, how many hours do you use a desk lamp daily?*
   - **a.** 0 hours
   - **b.** 1-2 hours
   - **c.** 3-4 hours
   - **d.** 5-6 hours
   - **e.** 7+ hours

7. *Do you use the overhead light and desk lamp simultaneously?*
   - **a.** Yes
   - **b.** No

8. *How often do you turn off the lights when leaving the room?*
   - **a.** Always
   - **b.** Often
   - **c.** Sometimes
   - **d.** Never

9. *On average, how many hours do you spend in the study lounge daily?*
   - **a.** None
   - **b.** 1-2 hours

c. 3-4 hours
d. 5-6 hours
e. 7+ hours

10. Please circle each major appliance owned.
a. Refrigerator
b. Microwave
c. Television (circle) CRT / Flat screen
d. Other:_____

11. How much TV do you watch daily?
a. 0 hours
b. 1-2 hours
c. 3-4 hours
d. 5+ hours

12. Do you use a power strip?
a. Yes
b. No (still ans. 13)

13. Please circle all that is plugged into the power strip.
a. Refrigerator
b. Microwave
c. Television
d. DVD player
e. Computer (circle) CRT monitor / Flat screen / Notebook computer
f. Video game consoles (1 2 3) Type:_____
g. Music player: (circle) Ipod speakers / CD player /
Other:_____
h. Printer
i. Alarm clock
j. Cell phone charger
k. Other:_____
__

14. Please circle what you leave plugged into the outlets while not in use.
a. Power strip with everything listed above
b. Television
c. DVD player
d. Computer
e. Video game consoles (1 2 3)
f. Music player
g. Printer
h. Alarm clock
i. Cell phone charger
j. Other:_____
__

15. If you do laundry on campus, please indicate how many loads you do in a month.

- **a.** 1
- **b.** 2
- **c.** 3
- **d.** 4+

Go to 19 if not a Plaza/Suite Resident

16. How often do you use the A/C or heater?

- **a.** Daily
- **b.** Twice a week
- **c.** Once a week
- **d.** Monthly
- **e.** Rarely
- **f.** Never

17. How many hours do you use the A/C or heater weekly? Indicate temp. setting.

- **a.** None
- **b.** 1-2 hours, Temp:_____
- **c.** 3-4 hours, Temp:_____
- **d.** 5-6 hours, Temp:_____
- **e.** 7+ hours, Temp:_____

18. How many people share the bathroom?

- **a.** 2
- **b.** 3
- **c.** 4
- **d.** 5

19. Please circle the lights you leave on when you leave the bath, if any.

- **a.** Bathroom
- **b.** Shower room
- **c.** Sink area

20. Which of the following incentives would encourage you to compost and/or recycle more? (mark all that apply)

- **a.** Education
- **b.** Monetary Incentive
- **c.** Other (please specify)

Please provide any additional comments below.

A3. Sample Fun Facts Tips sheet

Unplug chargers (think cell phones and iPods) when not in use. Only 5% of the power drawn by a cell phone charger is used to charge the phone. The other 95% is wasted when it is left plugged into the wall. Using a power strip makes it easy to turn off ALL devices when they're not in use.

About 190 million cell phones are used in the US. The combined stand-by usage of all those cell phone chargers, each drawing a measly watt, could add up to 190 megawatts per day. That's enough to power approximately 100,000 homes. –Matter Magazine

Set your computer to sleep after 10 minutes of inactivity. Screensavers DO NOT save energy – but sleep mode does!

If you are leaving your room for more than 15 mins, turn off the lights! Turning fluorescent lights on and off every few minutes shortens the lifetime of the bulb and actually costs you more to replace it. For incandescents, ALWAYS turn it off when not in use.

An average UCLA dorm resident produces 742 lbs of CO_2 per year through their energy consumption alone. This adds up to 6, 974, 800 lbs or 3, 487 tons of CO_2 per year for all residents on the Hill!