

Chestnut Living Lab Research Project

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Project Overview

- The Chestnut Living Lab is a living research project involving two Garden double apartments and the two pairs of students living in them at Ithaca College.
- One apartment is a standard Garden double, with all its fixtures reflecting the fixtures of the rest of the garden apartments. The other has been renovated using recycled and sustainable materials, new LED light fixtures and a low-flow faucet, toilet, and shower head. Using the unrenovated apartment as a control, we will compare the two apartments and assess both the quantitative (energy and water consumption) and qualitative effectiveness of the renovations.

Goals of Project

- This project aims to show that it is possible to have sustainable living habits while living in a college dorm setting.
- The behavioral experiments were designed to give us an awareness about our consumption of energy and water. We used different modes of consumption, using different amounts of water and electricity, to mimic other habits of consumption than our own.
- We collected quantitative data to show what different consumption models looked like in the dorm with low flow and energy saving fixtures compared to the regular dorm.
- We hope to use these measurements to evaluate whether behavioral or technological changes are more effective. We also want to explore whether the energy saved by the technologies outweighs the cost of them.

Electricity and Water Measurements

- We used the program "Curb Energy" to measure our electricity usage and the program "True Submeter" to measure our water usage.
- Curb Energy reports the electricity pulled by each outlet and light fixture within the apartments that is measured by an installed meter.
 - Electricity consumption is measured in Watts.
 - Shown by individual outlet and light fixture, as well as total per hour.
- True Submeter reports the water used by each appliance measured by point source meters on each water fixture.
 - Water consumption is measured in gallons.
 - Reported as total for month.

Behavioral Experiments

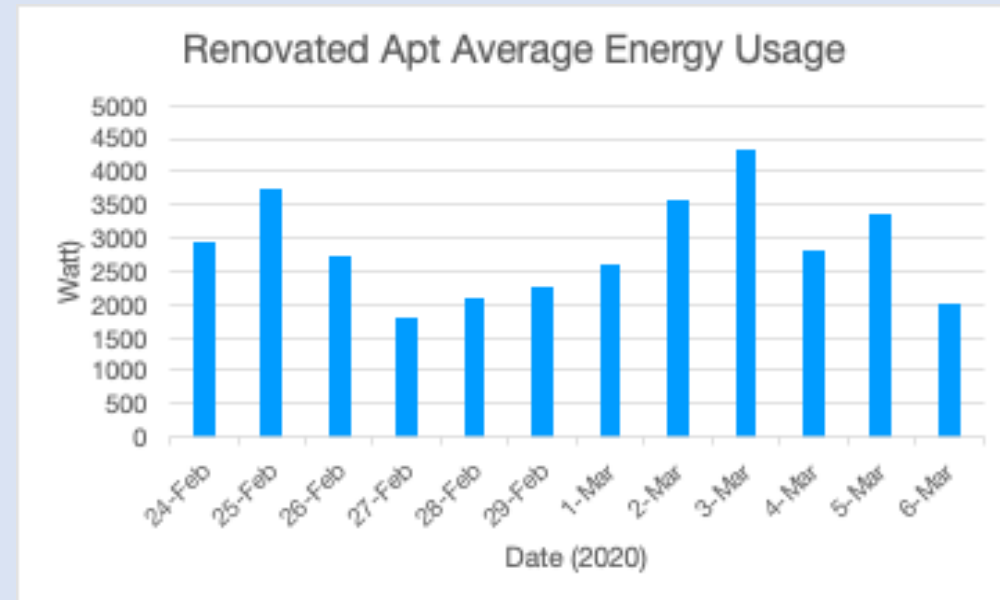
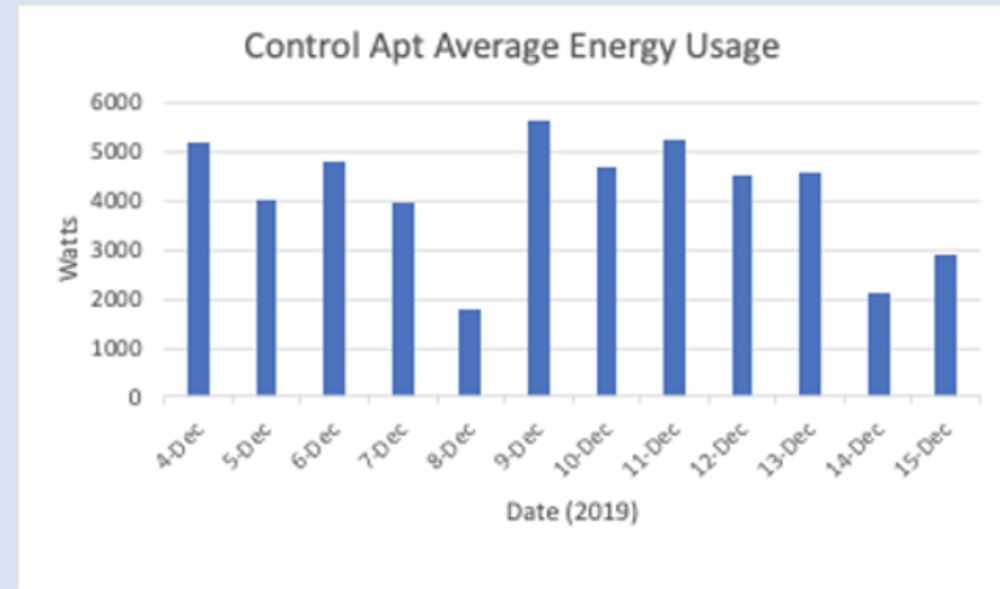
- We completed various behavioral experiments to simulate various lifestyle patterns and explore:
 - If behavioral changes or technological have a more significant positive impact on water and electricity consumption.
 - If the savings that the technological changes produce are worth the investment.
- The lifestyles that we simulated to compare to one another included:
 - Our normal patterns which reflected a general consciousness of consumption.
 - The lifestyle of an "average" college student in which we consciously tried to consume with less attention to conservation.
 - A pattern in which we put effort into targeting areas of our normal conservation that could produce further reduction in consumption, within reasonable effort.
 - A lifestyle of extreme conservation in which we put significant effort into consuming as little as possible, sometimes with extreme measures.

Broad Look at Data

- The preliminary findings from our data collection show that the apartment renovated with energy efficient fixtures consumed less electricity than the control apartment.
- We also found that the amount of water used in the apartments was less in the renovated apartment, even during a behavioral experiment when the apartment with more efficient water fixtures tried to use more water.
- The data monitoring devices provided us with different challenges, as most systems are meant to work on a larger scale.

Data Cont.

- These graphs represent periods of time when each apartment was replicating "normal college student behavior."
- We staggered the behaviors in our experiments, so the various lifestyle changes were made at different times in each apartment.
- On average the apartment with energy efficient fixtures used far less electricity than the apartment with regular fixtures.



Vermicompost

- Vermicompost is a method of composting in which worms are used to aid in the decomposition of organic material.
- Like regular composting, vermicompost helps divert food waste from going to a landfill in which it cannot properly break down and produces methane and creates nutrient-rich material that can be used to aid plant growth and health.
- However, vermicompost can be even more beneficial than regular composting methods as it produces more usable nutrients, has a shorter timeline to a finished product, can be done completely inside, and can require less space.
 - Looking at Ithaca College, small-scale vermicompost systems reduce the use of resources by a third-party compost facility such as gas for transporting the compost materials.

Vermicompost

- We set up a small vermicompost system using a plastic bin, lid, and netting material.
 - We then put in worms and fertile material from the vermicompost system in the campus greenhouse, added ripped up egg cartons for roughage, and began adding food scraps to be composted.
- The system is small, does not smell, and requires little maintenance, making it perfect for a dorm or apartment setting.
- It has been very educational and fun to put together the system and watch it thrive!



Making Kombucha

- Kombucha is a fermented tea drink made using a SCOBY (Symbiotic Culture Of Bacteria and Yeast). The base for the drink is just tea with some sugar added, which the Scoby uses to ferment it into a carbonated probiotic beverage with lots of vitamins.
- It can be flavored with fruits, herbs and vegetables and has numerous health benefits. You can start brewing kombucha using a piece of an existing Scoby. I'm able to produce a gallon of kombucha every week with mine.



DIY Projects: Vegetable Broth

- Saved vegetable scraps to make vegetable broth: all vegetable scraps and citrus rinds that would go to compost were saved in a bag in the freezer. When the bag got too full, the scraps were simmered in water with a Tbsp. of salt. After a few hours, the liquid was strained from the pot and the result was delicious vegetable broth.
- This gives scraps another purpose before going to compost and allows them to break down easier. It's also a way to have vegetable stock without creating excess waste.





Garden Tower Analysis

- Each apartment was outfitted with a hydroponic tower garden. The system works by planting seeds in rockwool or soil plugs and watering them in the tower with added minerals for nutrients. We also used growing lights to ensure we could grow vegetables in the winter.
- Hydroponic systems have the benefits of working indoors and being operable year-round, in addition to the vertical configuration of the tower being the most space efficient.

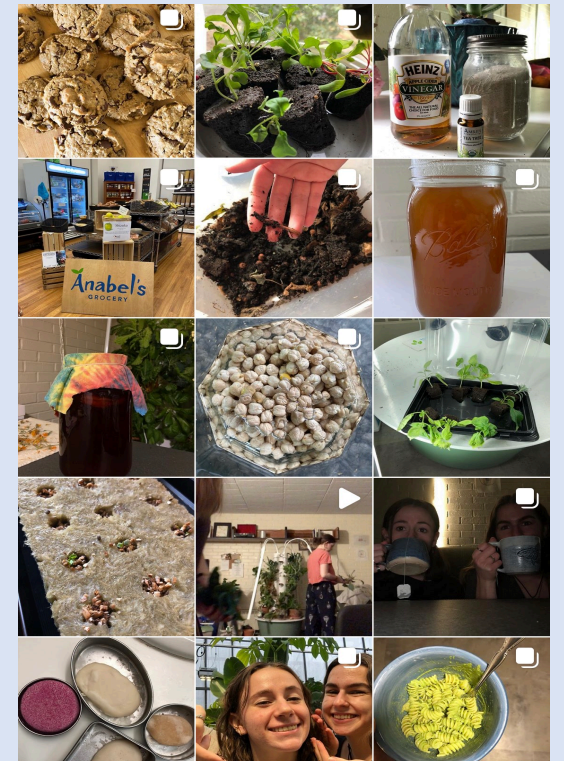


Garden Tower cont.

- In the control apartment we grew only lettuce and sweet basil for the fall semester. Not only did the availability of fresh produce encourage us to eat more vegetables, but the system has the capacity to pay itself off in money saved from buying store bought greens.
- We planted a variety of vegetables for the spring semester. Though their growth was interrupted, this system has the capacity to grow 20 different varieties of plants at the same time.

Blog and Instagram

- We created a blog and Instagram page to share our experiences with the research project, educate on various topics, and demonstrate our findings.
- Check them to see more DIY projects, recipes, data analysis and our experiences with the project!
- Blog: <https://chestnutlivinglab.wixsite.com/chestnut>
- Instagram: chestnutlivinglab



Looking Forward

- We are excited to continue this project into next year in order to collect more data, explore new topics and experiments, and further integrate sustainability into our campus!

Sources Consulted

- Brown, Paul. “Vermicompost vs. Traditional Compost: Which Is Better?” *Thriving Yard*, 3 Feb. 2020, <https://thrivingyard.com/vermicompost-vs-compost/>.
- Steve. “Vermicomposting 101: Plant and Soil Benefits of Vermicompost.” *Urban Worm Company*, 20 Dec. 2017, <https://urbanwormcompany.com/plant-and-soil-benefits-of-vermicompost/>.