



Reducing Energy and Water Usage in Smart Student Campus Housing

Clarkson University uses real-time energy feedback and motivational workshops to achieve electricity and water reduction on campus.

Research Objective

Clarkson University in Potsdam, NY teamed with IBM and the New York State Energy Research and Development Authority (NYSERDA) to investigate whether real-time feedback and motivational workshops could influence students living in campus housing to reduce their electricity and water usage. The 3-year project ran from Fall Semester 2013 through Spring Semester 2016.

Background

The campus apartments in the pilot are part of the Smart Housing Project, an interdisciplinary education, research, and operations project at the university. The project included the installation of end-use sensors that provided water and energy use data, as well as air quality measures in each of the apartment units. A Green Data Center supported by IBM provided data storage and computing power for the data analytics requirements of the project.

Pilot Description

The data collection period covered three academic years and the pilot evaluated energy and water usage by 353 students living in 77 smart housing apartments across four buildings. The smart housing apartment suites included a living room, kitchen, bathroom, and four or six separate bedrooms. Students living in building 1 attended a motivational workshop that provided educational information about the environmental impacts of energy and water use and were asked to commit to specific environmental behaviors to help reduce their environmental footprint while living on campus. These students also received real-time energy and water usage feedback on an electronic screen mounted to the living room wall. The interactive feedback displays showed the energy and water usage in both real-time and past use in daily, weekly, or monthly formats. Electricity usage by bedroom was also provided via individual messaging, web dashboards, and reports. Orbs were mounted in the showers and indicated shower duration in real-time. Students living in building 2 received real-time energy and water usage feedback and shower orbs, but did not attend a motivational workshop. Students living in building 3 received monthly hardcopy statements of their energy and water usage (without real-time feedback) and attended a motivational workshop, but did not receive shower orbs. Students living in building 4 served as the no treatment control group.

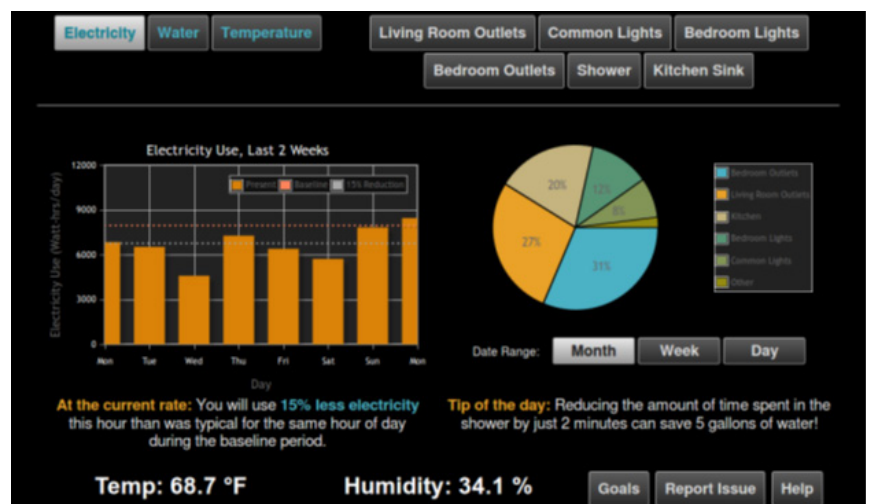
Percentage of energy and water reduction by intervention.

Combined Effect
21% less electricity than control

Students who attended a motivational workshop and received real-time feedback.

Motivation Effect
20% less hot water

Students who attended a motivational workshop versus those who did not.



Screenshot of the electronic wall-unit display

Visit NYSERDA's Behavior Research page nyserdera.ny.gov/behavior-research for more information.



Findings

The evaluation showed that students who attended the motivational workshop and received real-time feedback and shower orbs used 21% less electricity than students in the control group. The reductions were much greater than previous behavioral efficiency projects, which typically resulted in only a 5-12% decrease.

Students who received real-time feedback and shower orbs, but did not attend a motivational workshop, did not show significant reductions in electricity or hot water usage compared to the control group.

Students who participated in a motivational workshop and received a monthly statement of their energy and water usage, without real-time feedback, reduced their hot water usage by 20% but did not show significant reductions in electricity usage.

Conclusion

The pilot demonstrated that for participating students living in campus housing at Clarkson University, combining the motivational workshop with real-time feedback and the shower orb had the most significant impact (21% versus the control group) on the amount of electricity students used. The motivational workshop alone influenced students to decrease hot water use by 20%, but did not influence electricity usage.

Next Steps

Based on the positive results of this research, Clarkson University is working to secure funding to continue to develop and improve the sensor, feedback, and motivational workshops demonstrated in this pilot. The university is actively working with IBM to develop a commercially viable system in the next stage of this work.

More information about this project is available from Prof. Stephen Bird, Clarkson University (sbird@clarkson.edu) and Marsha Walton (marsha.walton@nyserra.ny.gov).

The most effective behavior change strategy to influence students to reduce their daily amount of energy and hot water was to provide a motivational workshop and real-time feedback.

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