

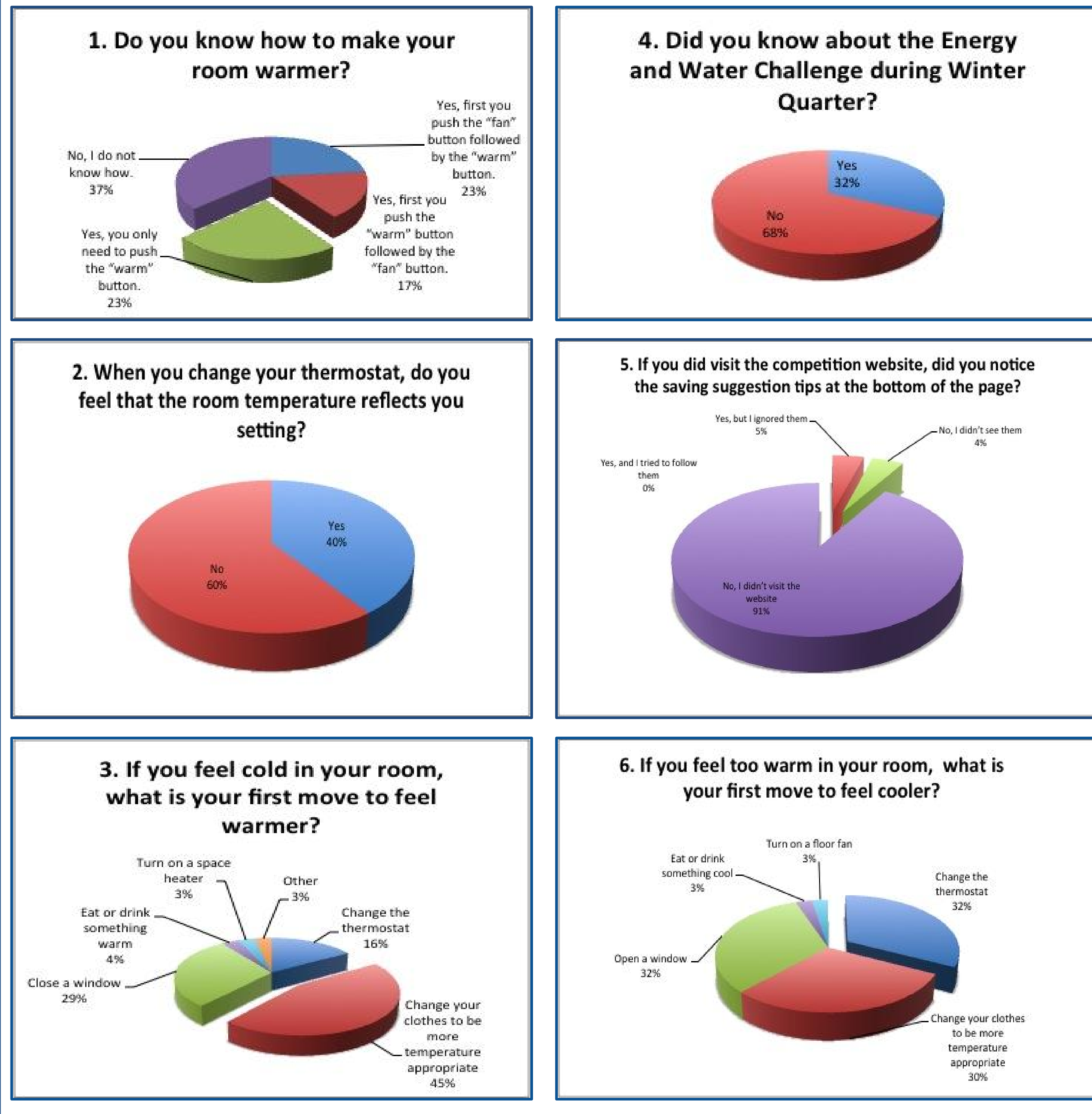


Consumer Energy Behavior Regarding Thermostat Use and Efficacy of Energy Related Challenges in Communal Living Situations: A Case Study of the UC Davis Freshmen Dormitories



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Key Survey Findings



Survey Results

- Only ~23% of students knew how to properly utilize their thermostats
- 60% of students do not feel that their room temperature reflects their thermostat setting
- Majority of students will engage in non energy consumptive when cold ie: put on warmer clothes, close a window
- 68% of students were not aware of the competition
- 94% did not know about the competition website
- Significantly more students will use thermostat when too warm

Purpose

- Analyze results, both qualitative and quantitative, pertaining to the energy and water challenge
- Provide recommendations for future challenges
- Discover student knowledge pertaining to thermostat use
- Discover how people typically react to thermal discomfort
- Discover thermostat efficacy on quantitative level to back up qualitative findings from the survey results.
- Analyze thermostat data to identify correlations, patterns, and trends

Methodology

- Water and Energy Survey was administered to students at all dormitories on campus
- Data was collected from thermostats and analyzed according to:
 - User Set Point (USP) vs. Indoor Air Temperature
 - Outdoor temperature vs. Indoor Temperature

Recommendations

- Improve marking scheme
- Collaborate more closely with Resident Advisor to market challenge
- Extend length of challenge
- Improve rewards for energy saving efforts related to competition
- Ensure thermostat efficacy and motion sensor
- Identify additional ways to save energy beyond thermostat use
- Conduct further research and modeling to discover whether individual room temperature controls is conducive to energy savings in communal settings
 - Include more variables in the model such as direction room faces, floor, r-value of walls, occupancy etc.

Key Data Analysis Findings

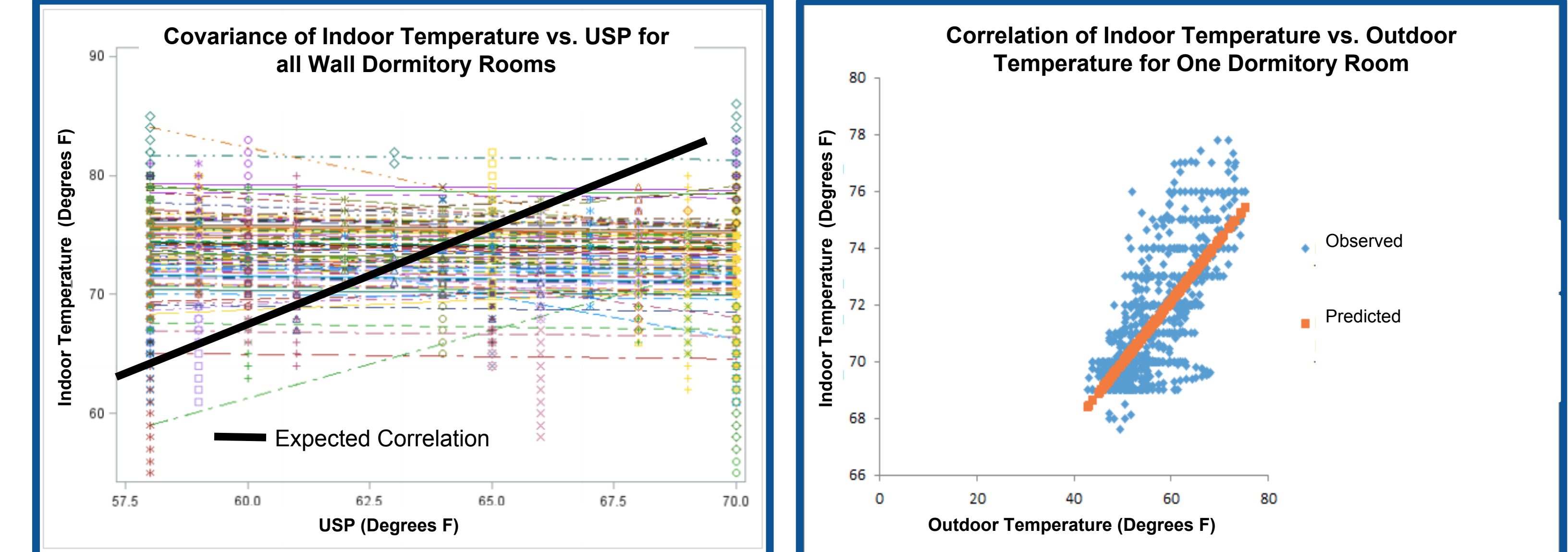


Chart 1. Demonstration of the lack of correlation between the USP and the actual room temperature.

Chart 2. Demonstration of positive correlation between the USP and the indoor room temperature.

Pearson Correlation Coefficient Comparison Among Dorms Outdoor vs. Indoor Air Temperature

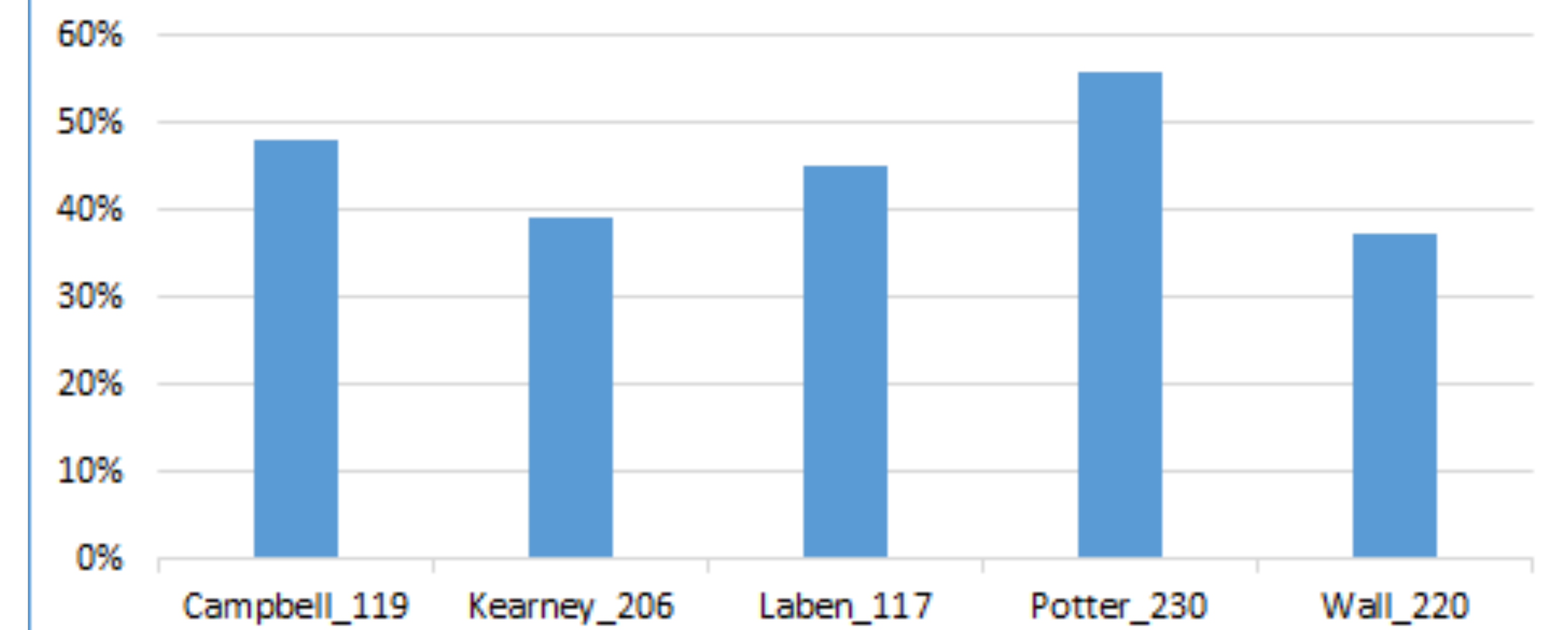


Chart 3. The Pearson Coefficient, as also as the R Square, describes the "goodness of fit" of linear regression line with the observed data points.

Data Analysis Results

- At three of the five dormitories, ~65% of rooms never changed the USP
- USP was only able to predict ~62% of the variability in the indoor temperature
 - Modeled using simple regression model: Indoor Temperature = $\beta_0 + \beta_1 * USP$
 - Where β_0 = intercept and β_1 = slope
 - There are other factors that play a large role in indoor temperature
- The majority of room-level indoor temperatures were positively correlated with outdoor air temperature
- Outdoor temperature was able to predict 37-56% of the variability in the indoor temperature, depending on the dormitory

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Reference

- Dr. Alan Meier
- Kiernan Salmon
- Dr. David Slaughter