Why Education and User Feedback Won’t Close the Performance Gap for University Accommodation

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Research Questions

1. How effective are different forms of feedback at curbing energy use among student populations?

2. Does an increased frequency of feedback impact the student’s energy use behaviour?
Behavioural economics shows that non-pecuniary interventions can be comparable to price based interventions to encourage energy conservation.

Feedback studies typically show 5% to 12% reductions in energy use. (wide range of methods)

Thaler and Sunstein described libertarian paternalism: behavioural nudges, while respecting freedom of choice.

American company called O-Power, employ the idea of nudges by including social norms in their Home Energy Reports.

*www.opower.com*
Method - Setup

Study of undergraduate students at Churchill College in Cambridge.

Asked to submit their electricity meter readings via email throughout winter term 2012.

Gas meter readings were not included.

Of the 426 total students, 138 submitted valid data for all four meter readings.
Method – Feedback Types

GROUP A - Information Only

**Your Energy Use in March!**
28 kWh

GROUP B - Descriptive Social Norms

**Your Energy Use in kWh!**
- **Efficient Neighbours**: 6
- **ALL Neighbours**: 17
- **YOU**: 31

You Used **83%** MORE energy than your neighbours.

Over a year, this could mean spending around £30 more than your friends on average. That’s enough for a nice dinner out, maybe your neighbours can treat you!

GROUP C - Descriptive and Injunctive Social Norms

**Your Energy Use in kWh!**
- **Efficient Neighbours**: 6
- **ALL Neighbours**: 17
- **YOU**: 21

You Used **25%** MORE energy than your neighbours.

Over a year, this could mean emitting around 66 kg of CO₂ more than your friends on average, leaving your computer on for an extra 246 days or driving a car an extra 76 miles more than your friends, or leaving your computer on for an extra 76 days in a row.

**Your Energy Use in kWh!**
- **Efficient Neighbours**: 5
- **ALL Neighbours**: 17
- **YOU**: 13

You Used **25%** LESS energy than your average neighbours.

Over a year, this could mean spending around £11 less than your friends on average.
## Results

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>Jan - Feb</th>
<th>Jan - Mar</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>31</td>
<td>1.86</td>
<td>1.74</td>
<td>1.58</td>
<td>6.3%</td>
<td>15.1%</td>
</tr>
<tr>
<td>B</td>
<td>45</td>
<td>1.49</td>
<td>1.28</td>
<td>1.27</td>
<td>13.8%</td>
<td>14.4%</td>
</tr>
<tr>
<td>C</td>
<td>44</td>
<td>1.58</td>
<td>1.37</td>
<td>1.24</td>
<td>12.9%</td>
<td>21.5%</td>
</tr>
</tbody>
</table>

### Average Electricity Consumption (kWh/day)

- **Group A**: Blue line, starts at about 1.9 and decreases to about 1.2
- **Group B**: Red line, starts at about 1.6 and decreases to about 1.3
- **Group C**: Green line, starts at about 1.6 and decreases to about 1.3

*Note: The chart shows the decrease in average energy use for each group over the months.*
Results – Group C

Averages: 1.24 1.37 1.58
## Results – By Feedback Type

<table>
<thead>
<tr>
<th>Group</th>
<th>Feedback Type</th>
<th>Image Received</th>
<th>Feedback Count (N)</th>
<th>Average Energy Use Reduction Following Feedback (kWh/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Descriptive only</td>
<td>![Image of feedback]</td>
<td>60</td>
<td>0.15</td>
</tr>
<tr>
<td>B1</td>
<td>Social Norms Negative</td>
<td>![Image of feedback]</td>
<td>34</td>
<td>0.20</td>
</tr>
<tr>
<td>B2</td>
<td>Social Norms Positive</td>
<td>![Image of feedback]</td>
<td>56</td>
<td>0.05</td>
</tr>
<tr>
<td>C1</td>
<td>Injunctive Norms Negative</td>
<td>![Image of feedback]</td>
<td>39</td>
<td>0.25</td>
</tr>
<tr>
<td>C2</td>
<td>Injunctive Norms Positive</td>
<td>![Image of feedback]</td>
<td>49</td>
<td>0.10</td>
</tr>
</tbody>
</table>

*Note: The image received for each feedback type shows a comparison of energy use between the participant and their neighbors, with various icons illustrating the percentage of neighbors who also reduced or increased energy use.*
## Results – Billing Data

### FEEDBACK STUDY

<table>
<thead>
<tr>
<th>Feedback Type</th>
<th>Fall Term (Oct-Dec 2011)</th>
<th>Winter Term (Jan-Mar 2012)</th>
<th>Easter Term (Apr-Jun 2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Participants (N=278) (kWh/day)</td>
<td>1.56</td>
<td>1.98</td>
<td>1.38</td>
</tr>
<tr>
<td>Participants (N= 138) (kWh/day)</td>
<td>1.22</td>
<td>1.56</td>
<td>1.09</td>
</tr>
<tr>
<td>% Difference</td>
<td>21.8%</td>
<td>21.1%</td>
<td>20.6%</td>
</tr>
</tbody>
</table>

- **Feedback Type**
  - Standard feedback (end of term bill only)
  - Enhanced feedback (emails with social norms)
  - Standard feedback (end of term bill only)
Results – Questionnaire

110 students responded to post-study questionnaire.

Half of students pay utility bills, half their parents. Reduction in energy consumption nearly the same regardless of who pays. Low impact of split incentives.

Despite high variability, energy use has very weak correlations with both occupied hours and number of appliances.

Before the study, only 10% of students discussed their energy use with peers, compared to 40% during the study. However, this made no difference to their energy use.
Research Questions

1. How effective are different forms of feedback at curbing energy use among student populations?

   A. Social norms are slightly more effective than information only.
      - Injunctive norms slightly help curb rebound effects.
      - No results are statistically significant due to high variability.
      - No causal link between messaging and energy use.

2. Does an increased frequency of feedback impact the student’s energy use behaviour?

   A. No.
      - The feedback study only identified participants already practicing efficient behaviour, increased feedback made no further difference. Results are statistically significant.
Context

Very limited study, quantitatively relevant to student accommodation only.

Results highlight the challenges of selection bias in feedback studies.

Clear potential for cost effective savings through behaviour change, however information and feedback programs face two challenges not sufficiently addressed:

1. How to avoid preaching to the converted?
2. How to provide information that leads to action?