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Switch on to 'switching off': Innovative approaches for achieving energy-efficient behaviours in universities

Final Report

A research report completed for the Department for Environment, Food and Rural Affairs by the National Union of Students.

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Switch on to 'Switching off': Innovative approaches for achieving energy-efficient behaviours in universities

Final Report to the Department for Environment, Food and Rural Affairs

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This project was conducted by NUS Services, who are a sister company to the NUS and within the NUS group. At the time of the project, NUS's Ethical and Environmental team were part of NUS Services, but are now part of the NUS Charity.

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- The University of Bradford
- Durham University
- The University of Leeds,
- The University of Central Lancashire
- The University of the West of England

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EXECUTIVE SUMMARY

This research project was based on the premise that individuals are more likely to adopt new habits during a period when they are undergoing a life transition and their habits are thereby disrupted. First year students in higher education, living in halls of residences, are often living away from home for the first time, but pay fixed residences fees and do not receive feedback on their energy consumption. Therefore in a period of habit formation, the cues to encourage the formation of energy-efficient habits are not in place. This research aimed to address this through a set of interventions targeted at a sample of first year students and focused on energy-efficient behaviours.

The core of this research involved five interventions, implemented at five different universities. The first intervention involved an *information campaign* at Durham University; the second involved *peer-to-peer encouragement* at the University of Leeds; the third, at the University of Central Lancashire (UCLan), involved raising awareness of the *energy efficiency of the built environment* (residences or the whole university); the fourth used *comparisons with others' or with past behaviour* to encourage behaviour change at the University of Bradford; while the fifth, at the West of England University (UWE), involved *financial incentives*. Each of these interventions is based on different academic findings and theories. Two additional case studies were included in the project to further explore behaviour change: face-to-face training in energy efficiency behaviours; and a second year study on habit persistence, which involved an email information campaign at Durham University.

The key findings of the research are considered against the research aims:

The first research aim was "To examine the effectiveness of a range of interventions for encouraging energy-efficient behaviour in halls of residences" Overall, we found the interventions tended to *maintain* pre-existing energy saving habits, which otherwise may have been lost due to prevailing disincentives to save energy in halls of residence. These interventions do not seem to be enough on their own to (notably) increase habit formation during a moment of change. However, the interventions are linked to attitudinal change and more frequent spontaneous awareness of methods of energy saving; they represent an important opportunity to prevent the loss of energy saving habits instilled through parental insistence and education.

The sample sizes obtained were too small to make it possible to determine clearly which interventions were effective from the quantitative data (meter reading and survey results). The results were at best indicative and in several cases the evidence from the meter readings and the surveys differed.

The second aim was "To examine differences in the effectiveness of the interventions amongst different segments and demographic groups". While the small sample sizes limit the conclusions that can be drawn, the data suggests that the interventions differentially impacted on male and female students (the latter being more engaged, consistent with previous research), and on different Defra segments (environmentally conscious/active segments showing more positive change, and less engaged segments showing more negative change. There is no consistent difference between

intervention and control groups suggesting these groups may have polarised *anyway*).

The third aim was "To explore the adoption of energy saving behaviours in the context of habit formation". As noted above, the interventions served more to maintain pre-existing good habits – usually instilled by parental insistence (and in some cases through school education) – than to create new energy-saving habits. However, our results also indicate the significant potential of the transition to private accommodation in students' second year as a 'moment of change' in which energy saving becomes a priority due to having control over energy bills and the capacity to be financially rewarded for energy efficiency efforts. Thus greater potential to increase habit formation may be seen in targeting students moving from halls of residences into privately-let accommodation, particularly where students take responsibility for their utility bills. Further research opportunities lie in understanding the wider implications of this, and the potential for partnerships with student letting agencies.

The qualitative data from focus groups suggested that there was little change in attitudes and most students (in most interventions) did not think that they had been affected by the interventions. However, the qualitative data provided a rich source of information on the barriers to influencing behaviour and how they might best be addressed. In terms of motivators/influences on behaviour change, we found that a variety existed including parental insistence and formal education, peer influence, perceived control, altruism, and financial motivations.

We also note that energy consumption is significantly influenced by the built environment (i.e., well-insulated/low-emission buildings vs. older inefficient buildings); such that the largest variation in energy use was observed between universities rather than between flats.

The fourth aim was "To explore the persistence of energy saving behaviours beyond the original contexts, following students after they leave halls of residences and move into private accommodation". There was very little quantitative data from the second year intervention or the follow up surveys with the intervention groups – most of the data is qualitative. However, as mentioned previously, greater potential to increase habit formation may be seen in targeting students moving from halls of residences into privately-let accommodation, particularly where students take responsibility for their utility bills, and further research opportunities lie in understanding the wider implications of this, and the potential for partnerships with student letting agencies.

The final aim was "To understand the most appropriate ways of targeting university students in terms of encouraging pro-environmental behaviours for the future". Based on the above findings about the drivers and barriers of energy saving behaviours and the impacts of the different interventions, we make the following suggestions for influencing behaviour:

- *Use multiple interventions in multiple contexts:* A combination of interventions is likely to work best to influence students' energy behaviour due to the range of motivations and barriers to behaviour change. Given the important influence of

parental insistence and formal education, peer influence, perceived control, altruism, and financial motivations, effective interventions are likely to include *informational, social, normative, and financial* measures targeted at *multiple time points and in multiple contexts* (e.g., school, home, halls of residence, private accommodation, university buildings, etc.)

- *Target interventions to the right moment of change*: Second year at university may be a more significant window of opportunity to engage students in energy saving, since this is where the external (i.e., financial) incentives for behaviour change are greater. Designing suitable interventions needs to involve relevant delivery agents, such as landlords and letting agents. Although second year at university may be a more significant window of opportunity, interventions in the first year may act as useful lessons or practice to be drawn on in the second year (e.g., as at UWE, Leeds)
- *Design and locate information appropriately*: Information should be located where behaviour is carried out (e.g., by light switches, kettles); and given competing informational demands, emails tend to be ignored as will posters in the wrong place or which are not eye-catching. Since there are different preferences for informational content (images, statistics, etc.) and how to receive energy information, a mix of designs and formats may be most effective at engaging large numbers of students.
- *Choose and train peer representatives carefully so that they engage well with their fellow students:* Peers should be well briefed, enthusiastic and be able to communicate well in order to be effective.
- *Provide information early and dispel misperceptions*: Since a common barrier to energy saving is perceived lack of control, this suggests a need for educational/or infrastructural interventions. Where students are unaware of energy saving behaviours that they can carry out in their halls of residence, there needs to be more focus on educating students about this when they start university
- *Target intrinsic and extrinsic values*: Competitive interventions often motivate students but they may backfire if measures to avoid cheating are not implemented; these might include better security between floors. However, any scheme which encourages energy saving for purely financial or material reward reasons risks this kind of behaviour as a side-effect. A better approach is likely to be to motivate change for *both* environmental and financial reasons.
- *Target 'meaningful' social groups*: Norm-based messaging (i.e., comparative or competitive) only works under certain conditions, and may even lead to an increase in energy use (e.g., those who consume less than the comparison group). This approach requires target individuals to feel part of and identify with the group (e.g., flat rather than whole floor) they are being implicitly linked to.
- *Structure incentives appropriately:* Utilise variable rather than fixed financial incentives (i.e., responding to amount of energy used – a more accurate signal) and at an appropriate level. Non-financial incentives (e.g., cinema tickets) may work better in some cases than financial ones.

In terms of scalability, the variation according to building construction highlights the need to complement behaviour change measures such as those explored here, with *broader planning and other policy changes*. Crucially, though, the energy-efficient halls intervention here suggested there may be a risk of rebound effect if the environmental credentials of buildings are highlighted without motivating students to change their behaviour, too.

The strengths of using action-based research (ABR) in this project have included grounding research in participants' experiences and local delivery partners' expertise; and being flexible to adapting or refining research design in response to changing circumstances/findings. However, we also encountered various challenges which may comprise research quality (e.g., difficulties recruiting sufficient participants due to competing activities and low interest in energy/environmental issues; timing/impact of research and interventions in relation to external pressures/activities; lack of buy-in or resources by some local delivery partners, as well as different approaches to intervention delivery; miscommunication and technological problems leading to gaps in data collection). These difficulties were partly overcome by using multiple methods (qualitative, quantitative and outcomes data) and adapting the research design during the project.

Finally, we suggest that future research might focus on the transition to students' second year as a moment of change and particularly consider whether landlords and/or letting agents might represent important intermediaries for encouraging energy saving amongst students as they take on energy management responsibilities for the first time. Such a study might also consider other (non-student) populations at the same formative stage of life (i.e., aged18 to 24) and consider mechanisms for fostering energy durable saving habits.

1 INTRODUCTION

1.1 About this report

This is the final report of the Defra-funded research into the relative effectiveness of five interventions designed to reduce energy consumption within halls of residences at five different universities. The research was based on the broad premise that individuals are more likely to adopt new habits during a period when they are undergoing a life transition and their habits are thereby disrupted, as predicted by the 'habit discontinuity hypothesis' (Verplanken *et al.*, 2008).

First year students in higher education, living in halls of residences, are often living away from home for the first time, but pay fixed residences fees and do not receive feedback on their energy consumption. Therefore in a period of habit formation, the cues to encourage the formation of energy-efficient habits are not in place.

This research project aimed to address this through a set of interventions (one intervention per university) targeted at a sample of first year students and focused on energy-efficient behaviours. The interventions were delivered by each of the five universities; the University of Durham, the University of Leeds, the University of Central Lancashire (UCLan), the University of Bradford and the University of the West of England (UWE). The project was designed and co-ordinated by NUS Services Limited and academic insight was provided by Dr. Lorraine Whitmarsh (Cardiff University) and Professor Bas Verplanken (University of Bath).

The research explored five diverse interventions: General awareness campaigns; Competition and comparison; Peer-to-peer encouragement; Awareness of the university and / or the halls of residences as carbon efficient entities; and, lastly, Financial incentives. In delivering these, the research explored how the adoption of energy-efficient behaviours can be encouraged at a time of transition in the individual's life, where energy management arrangements can be perceived as a barrier to energy-efficient behaviour.

This report begins by outlining the project's context, rationale and overall aim (Part 1). It then describes what we did, including the research methods and intervention design (Part 2), before detailing the findings and outcomes of the project (Part 3) and what we learnt, including the implications of the project for policy, practice and research (Part 4).

1.2 HE sector and Halls of residence

Over 2.3 million students are in Higher Education (HE) in the UK, attending 190 HE institutions (HEIs). Of these, around 506,000 (22%) stay in halls of residence each year (Unipol, 2008; NUS Services, 2008). Approximately 347,875 (69%) of these bed places are in halls owned by HEIs and the remaining 158,125 (31%) are run by private providers (Unipol, 2008). Of the 506,000 students staying in halls, 225,170 (45%) of these are first year students, many of whom will be living away from home for the first time (NUS Services, 2008).

Within England, over the academic year 2006/07, the combined total energy spend of the HE sector was £250m, of which £73.5m (30%) was used in halls of residences

controlled by HEIs (HEFCE, 2008). There are 1.8 million students in HEIs in England. Assuming 22% stay in halls each year, the average energy spend per bed for HEI-run halls was £185. By extrapolation the total annual energy spend for the halls of residence sector (controlled by HEIs and private) in the UK was in the order of £94m.

Using the same HEFCE data, the combined total carbon emissions for the halls of residences controlled by English HEIs in 2006/07 was 401,315 tonnes of CO2 (HEFCE, 2008). Using the same assumptions this gives average per bed carbon emissions of 1.01 tonnes of CO2 for halls of residence controlled by HEIs. By extrapolation the total annual carbon footprint for the halls of residence sector (controlled by HEIs and private) in the UK is in the order of 513,000 tonnes of CO2. This equates to 0.37% of UK domestic sector emissions (DECC, 2010).

Virtually all halls of residence providers charge a fixed rent inclusive of all utilities through assured short-hold tenancy contracts. These all-inclusive contracts create a lack of incentives and in some instances a clear disincentive to manage energy-efficiently (Loughborough University, 2004). Yet behavioural change is identified as one of the most cost-effective ways of reducing emissions from the HE sector in order to meet HEFCE's target of 50% cut (compared to 1990 levels) in emissions by 2050 (SQWEnergy, 2009). Information on historic schemes to reduce energy consumption within halls of residences can be found in section 2.1 (Behaviour change interventions).

1.3 Targeting students' energy habits

Within the sector there is the potential to save considerable amounts of energy and carbon through behavioural change interventions in halls of residence. Even a 5% reduction across the 506,000 rooms would equate to savings of £4.7m of energy and 25,640 tonnes of CO2 (at 2008 prices). However, there is a greater significance of developing energy-efficient behaviours by students living in halls, as the following theories outline.

The habit discontinuity hypothesis (Verplanken et al, 2008) suggests that it is easier to get people to adopt energy-efficient behaviours if they are going through a lifestyle change, such as moving house. In contrast to commonly used theories in social psychology (e.g. the Theory of Planned Behaviour; Ajzen and Fishbein, 1980) behaviour is often not preceded by intention, but is the product of habit or 'routines' (see also Darnton, 2011). When an action is satisfactorily repeated several times, it becomes less considered and more automatic; this habitual action is automatically triggered in a particular situation. For instance, 'I need to go to the shop, so I will drive' (Verplanken et al, 1998; Verplanken and Wood, 2006).

Similarly, many energy behaviours are habitual, making them particularly difficult to change (APA, 2009; Nye et al, 2010). In particular, using conventional communication approaches to change behaviour will have little effect, because habits reduce individuals' attention to information about alternative courses of action (Verplanken et al, 1997). Rather, habits need to be disrupted, either by individuals making specific plans to perform alternative actions or by using or creating changes in the environment in which individuals act, subsequently forcing individuals to reconsider behavioural options (Verplanken and Wood, 2006). For example, travel habits are broken when people relocate or change employer; so providing information about public transport

just after people have moved house is much more likely to encourage modal shift, compared to providing this information in stable behavioural contexts (Bamberg, 2006; Verplanken et al, 2008).

Each year around 200,000 young people live away from home for the first time in halls of residence, which may involve major physical, economic, social and psychological changes. Given that many behavioural habits can be difficult to break once started, the sooner good behavioural habits are established the better (Verplanken et al, 2008). At present the vast majority of universities charge all-inclusive rents within halls of residence, and there is a real risk that many young people living away from home for the first time will pick up negative energy management behaviours that will extend beyond their time in halls.

On the other hand, since behaviours are context-cued (Verplanken and Wood, 2006), we should not necessarily expect durability of behaviours beyond the context in which they were learnt. For instance, once students leave university, find jobs or move home, energy behaviours picked up during university may not persist. To date, little research has examined habit formation and durability across contexts.

Consequently, as an extension to the original project design, we include a second phase of data collection. This includes students in their second year of university who live in private accommodation. We hypothesise that the transition from living in halls to living outside university may represent another – potentially greater – window of opportunity (or 'moment of change') in which to influence student behaviour. Indeed, the situational cues associated with energy management (i.e., receiving and paying bills) are more similar to traditional residences in private accommodation than in halls, so behaviours learnt in students' second year may be more durable than those learnt in their first year of living away from home. Whether the greater 'window of opportunity' for low-carbon habit formation exists in the first or second year of university, such a rapid turnover of influential young people at a key stage of their lives could provide significant strategic opportunities to Defra in relation to energy efficiency through energy-efficient behaviours.

Behaviours to save energy have been distinguished as 'conservation' and 'efficiency' actions – the former referring to on-going, curtailment behaviours and the latter to infrequent purchases of appliances or products (see Whitmarsh et al., 2011 for a review). Given the focus of this project on habitual behaviour, most of the behaviours examined are conservation behaviours (e.g., turning off unused lights; putting lids on saucepans; see section 2.4.4 (Selecting energy saving behaviours) for a full list of behaviours studied). Throughout the report, we refer to these behaviours to save energy as 'energy-efficient' behaviours. As noted, we recognise that these behaviours are likely to be shaped by the context in which they are performed, including the physical, cultural and social environment, as well as by individual knowledge motivations and values (Nye et al., 2010; Whitmarsh et al., 2011). Interventions to change energy behaviour thus need to account for these structural and individual factors, as well as the invisibility of energy and the routine, habitual nature of energy use. As far as possible, these considerations are built into the range of informational, financial, social and structural interventions included in this project (see section 2 What we did).

Previous research shows different approaches can work to change energy behaviours. In respect of information provision, this can help make energy use more 'visible', address knowledge barriers (e.g., how to save energy), or highlight the benefits of energy saving (e.g., saving money, cutting carbon; Maibach et al, 2008). Such approaches are more likely to be effective when targeted to audience motivations and to the time and place of energy use (e.g., Whitmarsh et al, 2011). Information alone, however, is often insufficient to change behaviour, particularly in the presence of strong habits.

Message source is often just as important as its content and format in influencing attitudes and behaviour (Petty and Cacioppo, 1986), and peers can be particularly persuasive and influential in shaping our behaviour. Studies also show that giving a verbal commitment to do something is a particularly effective form of eliciting behaviour change (e.g. Gardner and Stern, 2002). Other kinds of social approach to behaviour change include using social identity and norms to influence motivation and compliance through competitive and comparative schemes (e.g., Siero et al, 1996). For example, telling people about how most people act (particularly people who are identified with), will encourage behaviour change towards this stated norm (e.g., Rabinovich et al, 2010).

Energy saving is most often motivated by financial gains (Whitmarsh, 2009), so economic interventions are another effective way to influence energy use. Congestion charging, for example, has seen significant reductions in car use (see, e.g., Richards, 2006), and rewards (financial or otherwise) have similarly been shown to be effective in changing domestic energy use (Abrahamse et al. 2005). The artificiality of the situation within halls of residence represents a unique context with no financial incentive to save energy, which is rarely mirrored outside the sector, however affects approximately 800,000 students per year. The impact of this artificial rental model is unknown and this research is a truly original exploration of the impact of this context in terms of habits and behaviours.

Finally, changing the built environment or technologies can influence energy behaviours. For example, reducing road space or parking can encourage use of alternatives to driving (e.g., Whitmarsh et al., 2011) and smart meters can help encourage energy saving (at least in the short-term; Burgess, Hargreaves, & Nye, 2011). However, research in this area also shows that increases in energy efficiency may be partly offset by increased energy (or other) consumption because lower bills leads to more energy or other resources being consumed (i.e., the 'rebound effect'; Herring and Sorrell, 2008). It is beyond the scope of this project to alter the physical structure of students' accommodation, but one of the interventions provides information about the energy efficiency of the built environment.

As discussed further in section 2 (What we did), the informational, social, financial and structural interventions applied in this project are based on previous evidence which has indicated their efficacy in changing energy habits. Few comparisons of different approaches exist, however, and as we now discuss, it is the aim of the project to directly compare the relative efficacy of these approaches. The approach was adopted to allow for the teasing out of motivations and barriers on an individual and group level, and alongside a qualitative assessment, of how the interventions delivered are able to influence these, and affect behaviours and habits.

The initiatives research in this project are divided into five types of intervention:

Intervention 1 - General awareness campaigns
Research shows that some students in halls of residence are not aware of what they can do to save energy (Loughborough University, 2004). General awareness campaigns to encourage students to save energy and educate them how to do so have been carried out in a number of universities (e.g. Hull, Lancaster, Manchester). This includes putting up stickers by light switches in rooms, providing energy saving communications in freshers packs, and student-targeted media press work in university communications. In general, research suggests informational approaches alone can result in up to 9% cuts in energy use (Maibach et al., 2008).

Intervention 2 - Peer-to-peer encouragement
Peer-to-peer encouragement through environmental student champions, such as the student ambassador scheme at the University of Bradford, the student environment representatives at Durham University, and the student green rep scheme at Leeds University. In general, social and persuasive approaches have been shown to be reasonably effective in producing behaviour change in relation to environmental issues (Gardner & Stern, 2002).

Intervention 3 - Low-carbon University and energy efficient halls
The motivational effect of a low-carbon University and energy efficient halls of residence. Research shows that students that feel that their University isn't taking action on carbon emissions, or their building is wasteful of energy beyond their control, are less likely to save energy themselves (Loughborough University, 2004). An example of an environmentally-friendly hall of residence is the Ecohalls managed by the private provider UPP at Lancaster University which is equipped with a well-publicised waste heat recovery system and has a BREEAM rating of Excellent.

Intervention 4 - Comparative and competitive
These interventions play on the competitive element of students living in halls of residence. There is evidence that providing comparative feedback is an effective tool to motivate employees to become more energy efficient (e.g., Siero et al., 1989). Within the last four years a number of halls competitions have been successful in reducing energy consumption compared to the previous year. Although many of the competitions have small prizes as an incentive, there is evidence to suggest that the comparative element between halls is a key motivational factor, building on the strong community bonds within halls through inter-halls competitions (e.g. Loughborough University, 2004).

Intervention 5 - Financial incentives
A small number of halls providers have trialled financial incentives for saving energy. These include financial prizes through inter-hall competitions (University of the West of England), returnable energy deposits if students within blocks use less than a pre-determined amount of energy (Sheffield Hallam University; Unipol), and separately-metering individual student rooms and charging students for the energy the use (University of Sunderland).

All of the above interventions have been developed by early innovators at the local level within the last four years. This flurry of development is likely to be a direct response to increasing energy costs, which have typically doubled from an average of £0.07/kWh in 2005/06 to £0.14/kWh in 2008/09. Some of the initiatives may have been developed in response to the Carbon Trust's Higher Education Carbon Management Programme, now in its fourth year, which helps HEIs develop strategic carbon reduction plans. Although the initiatives outlined above have been analysed and promoted locally by the individual institutions, to date there has been no detailed study on the comparative benefits of each type intervention and there is no published guidance for the sector to follow.

1.4 Why Action-Based Research (ABR)?

Defra commissioned this research project as part of one of its early phases of Action Based Research (ABR). The aim of the ABR programme is to take new insights and innovative approaches and explore how they can be applied to a particular policy problem – in this case encouraging students to become energy efficient during a 'moment of change'. The programme builds on the evidence base which shows that innovative solutions are required for people to live sustainable lifestyles. These small-scale pilot research projects are designed to test the effectiveness of innovative approaches, in real world situations, where evidence and theoretical insight suggest there are opportunities to achieve lasting change. Rather than trying to quantify the impacts of the interventions being tested, the reflective nature of these small-scale projects provide the opportunity to learn and provide feedback as the project progresses, and assess its outcomes.

The exploration and observation of the rich insights gained from action-based research contribute substantially to the way in which they provide valuable lessons for similar interventions in the future. Indeed, they provide an important stepping-stone to developing a case for, or against, wider scale-up or rollout in a proposed context.

Action research is a cyclical inquiry process, in which real life problems are observed and diagnosed, action steps are planned and implemented, and the outcomes of these actions evaluated. This evaluation facilitates a new diagnosis of the situation based on learning from the previous activities' cycle (Elden and Chrisholm, 1993).

Action research involves those from the experimental groups and those delivering services in the research process (Pain, 2004), reflecting the belief that participants and practitioners have experiences and expertise which is vital for understanding and improving interventions (Torre and Fine, 2006). Action research was essential to NUS Services because it allowed the research team to interact directly with, and gain deeper insights from, students in the study, as well as facilitating on-going dialogue with and involvement of local delivery teams in relation to data capture. This reflective approach enabled research methodologies to be refined and developed throughout the course of the research by the research team in collaboration with those on the ground delivering interventions.

1.5 Aims

Action-based research was commissioned in 2009, based on the energy management behaviour goal referred to in Defra's original framework for pro-environmental behaviour (Defra, 2008; see Defra, 2011 for the updated framework). Student groups are classified as having high ability to act but generally low willingness because of the lack of financial incentives. The core aims of this research are identified below:

1. To examine the effectiveness of a range of interventions for encouraging energy-efficient behaviour in halls of residences
2. To examine differences in the effectiveness of the interventions amongst different segments and demographic groups
3. To explore the adoption of energy saving behaviours in the context of habit formation
4. To explore the persistence of energy saving behaviours beyond the original contexts, following students after they leave halls of residences and move into private accommodation

The primary aim of this research was to examine the success of a range of existing interventions for encouraging energy-efficient behaviour in the absence of other incentives. In doing so, we applied insights from Defra's core set of principles and approaches on achieving behaviour change, specifically the model of the 4 Es (enable, encourage, exemplify and engage; see Appendix 1 for details). We also explored the motivators and barriers for energy-efficient behaviours in halls of residence. The defined behaviour goals were all related to domestic energy use, such as switching off lights when leaving a room, not opening windows when radiators or heaters are on, and only boiling the amount of water needed in a kettle.

As well as examining the effect of a range of interventions on students' energy-efficient behaviours, this research examined how each intervention affects the persistence of these behaviours as students leave halls of residence and move into privately-let accommodation. This was explicitly explored as a moment of change – both in the context of the habit discontinuity hypothesis, and in terms of appropriate points of entry for targeting students with energy-efficient initiatives.

Students constitute a cohesive population group covering a cross-section of society and all segments of the Defra segmentation model (Defra, 2008). As such, following investigation into how the Defra segments are represented across the student body, this research sought to increase understanding about the segments, especially how they apply to younger people and those going through lifestyle changes. This research also examines how the segments, and various independent demographic factors, might be impacted differently by each of the interventions in encouraging energy-efficient behaviour.

A representative sample of universities covering the gamut of university types – 'Russell Group', '1994 and Campus', 'The Mets' (polytechnics and Colleges of Arts and

Technology) and 'Small or Specialist'[1] are included within this research in order to gain detailed understanding of the similarities and differences between their respective demographics (see section 2.3.2 Sample representativeness).

This research takes a quantitative and qualitative approach to understanding these aims, and a large part of the analysis is of a qualitative nature to embrace the ABR methodologies and to extract the maximum insight from a small sample at each institution. Statistical analyses are not shown within the quantitative data, and quantitative findings should be treated as indicative. More information on sample sizes is available in section 2.3 (Sampling).

[1] The Russell Group consists of 24 research-intensive universities across the UK. The 1994 group was a coalition of smaller research-focused institutions (the group was dissolved in November 2013).

2 WHAT WE DID

Section 2 describes the methodologies employed to meet the project aims outlined in section 1. It begins by describing the interventions at each institution in terms of behavioural theory, research methodologies and intervention design and implementation. Measures taken to ensure robust monitoring and evaluation, as well as limitations of the research, are described. Five interventions were conducted across five campuses between January and June 2010, spanning two academic terms, with an additional habit persistence case study included, taking place at the beginning of a second academic year (Oct-Dec 2010). Each intervention was based on discrete, small scale examples of these approaches which were in evidence in June 2009, however had not been compared or monitored in detail (see section 2.2.1 – 2.2.5). The research methodologies sought to address this

2.1 Behaviour change interventions

The core of the project involved five behaviour change interventions, implemented at five different universities. The first intervention involved an information campaign at Durham University; the second involved peer-to-peer encouragement at the University of Leeds; the third, at UCLan, involved raising awareness of the energy efficiency of the built environment (residences or the whole university); the fourth used comparisons with others' or with past behaviour to encourage behaviour change at Bradford; while the fifth, at UWE, involved financial incentives. Each of these interventions aimed to change students' energy behaviours within halls of residence, but through different mechanisms and drawing on different academic findings and theories. Two additional case studies were included in the project to further explore behaviour change. The first involved intensive face-to-face training in energy efficiency behaviours. The second was a follow-up study on habit persistence, conducted at Durham University.

As outlined in section 1.3 (Targeting students' energy habits), energy use is determined by both structural and individual factors, and various approaches have been found to effectively change behaviour. As also noted, it was beyond the scope of this project to alter the physical environment or to implement new technologies. Rather our focus was primarily on low-cost informational, social, and financial, which could be easily replicated or up scaled, but nevertheless offered different insights into ways of shaping energy habits at different time points. An overview of the interventions is provided in Figure 1.

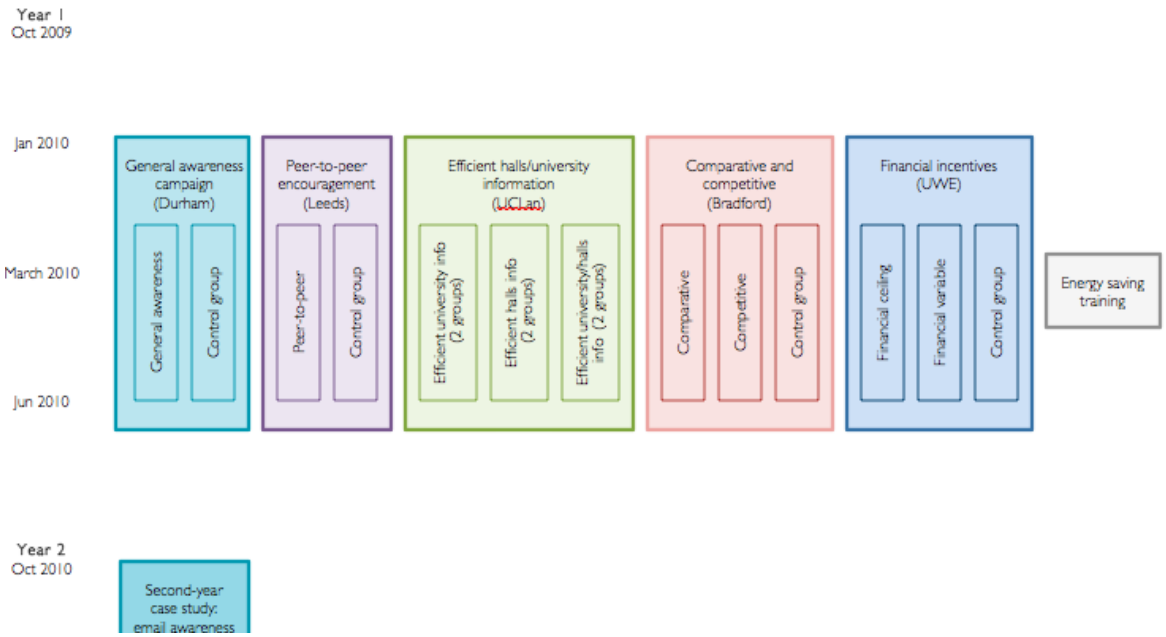

Figure 1. Overview of behaviour change interventions and timeline

The following sub-sections describe existing initiatives and evidence, and then detail the interventions used in the current project. Where possible we refer to evidence from previous studies with student samples, as well as to the wider literature. However, while many initiatives exist to foster energy-efficiency habits amongst students, our literature review has found that few have been evaluated. The lack of robust evidence of effective energy behaviour change initiatives with student samples highlights the importance of this ABR project for developing the evidence base. Full sample sizes in terms of number of students per meter and the total student sample are shown in figure 2 below.

University	Heads per meter	No of meters	Total student sample	Control group sample	Intervention group sample
Bradford University	28	6	168	56	56 (competition) 56 (comparison)
Durham University	100 (Tees block) 58 (all other blocks)	4	254	96	158
Leeds University	6	10	60	30	30
UCLan	6 (Kopa) 14 (Roeburn)	16	159	40	39 (university information) 40 (hall information) 40 (university and hall information)
UWE	6	9	54	18	18 (fixed incentive) 18 (variable incentive)

Figure 2 - Sample size and meter arrangements

Samples at each institution were chosen in order to best represent a demographically diverse first year student sample. To ensure that the sample was geared to the moment of change whereby the respondents were living away from home *for the first time,* flats devoted to third year students were excluded from the sample as were flats devoted to mature students who were likely to have lived away from home prior to starting university.

This process took place based on the demographic data shared with the accommodation providers at each institution prior to the commencement of the first term in the 2009/2010 academic year, and was based on age, gender, year of study and international status. A 'best fit' approach was taken to ensure representativeness as close to those of the Higher Education Statistics Agency (HESA) statistics available at the time.

The decision to sample at five institutions rather than across one institution was to allow for a national picture of student types to be included within the research. Universities fall into different mission groups and attract different demographics of students according to the nature of the institution. Consideration of the geo-demographics of the student population drove the decision to run the research across a number of institutions rather than one. This was felt to offer the advantage of sampling a broader range of student types, more like that of the wider population within the UK, and to ensure purity of research, meaning that it would be unlikely that a respondent within one intervention would be socialising or discussing the research with a respondent at another intervention. At each intervention, flats or groups of students werechosen on the basis of representativeness of the UK Higher Education student population, with specific flats selected on a random basis to exclude bias or influence. Individuals were given an 'opt out' if they did not want to take part in the research and an alternative flat, also randomly selected, chosen instead.

2.1.1 General awareness (information) campaign – Durham University

Existing initiatives and past research

Research shows that some students in halls of residence are not aware of what they can do to save energy (Loughborough University, 2004). General awareness campaigns to encourage students to save energy and educate them on how to do so have been carried out in a number of universities (e.g. Hull, Lancaster and Manchester). Such education includes putting 'switch-off' stickers by light switches, providing energy saving communications in freshers' packs and university communications through student-targeted media. Information campaigns to encourage energy saving amongst students have shown some success, although less so than community-based social marketing approaches which use multiple methods to remove barriers to behaviour change (Marcell et al., 2004).

In general, research suggests that informational approaches alone can result in cuts in energy use of up to 9% (Maibach *et al*, 2008). Such approaches are more likely to be effective when: (a) tailored to audience interests/concerns and existing understanding; (b) located close to the point of energy use (e.g. beside light switches); and (c) providing salient feedback on how much energy has been used (e.g. via tailored billing; Whitmarsh *et al*, 2011). As far as possible, these lessons were applied in the current intervention: information was designed to be eye-catching and appeal to the target

group, and often positioned where relevant behaviours would be carried out. (Feedback was used in the comparative and competitive intervention – see section 2.1.4).

The impact of information campaigns tends to be limited in the presence of habits, however, because they make people less receptive to information about alternative courses of action (Verplanken *et al,* 1997). Recognition of this informs the design of this project, in which it is expected that energy messages will have greater effect during a 'window of opportunity' in which habits have been disrupted (see also section 2.1.7 Second year case study).

The intervention

An intervention was run in four blocks of the Van Mildert accommodation (see Figure 2), each containing 58 to 108 student flats, separately metered for electricity and gas. From January to June 2010:

- **Control**: students in two of the blocks received no energy saving awareness communications.
- **Information**: students in the other two blocks were provided with a series of positive energy-efficiency communications designed for students (i.e., the intervention group).

Communications included a one-off installation of stickers on all flat light switches, fortnightly posters in kitchens and energy efficiency notice boards offering regularly updated advice (see Figure 3), plus a one-off leaflet drop underneath doors to student rooms.

Sample: 254 Durham students in Van Mildert college.

Figure 3. Derwent block (left) and Tees block, Durham University

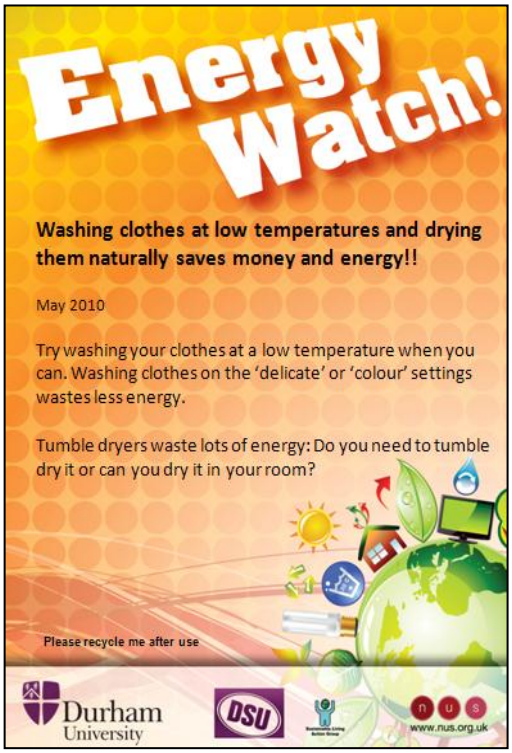

Figure 4. Example *Energy Watch* poster, Durham

2.1.2 Peer-to-peer encouragement – University of Leeds

Existing initiatives and past research

Peer-to-peer encouragement through environmental student champions has taken place at several universities, such as the student ambassador scheme at the University of Bradford, the student environment reps at Durham University and the student green rep scheme at the University of Leeds. In general, social and persuasive approaches have been shown to be reasonably effective in producing behaviour change in relation to environmental issues (Gardner and Stern, 2002), including amongst students in halls of residence. Erickson and Skoglund (2008), for example, used 'eco-reps' to encourage energy efficiency behaviour amongst peers through door-to-door contact, group activities, social networking and information provision at the University of Vermont. However, this programme was not evaluated. Furthermore, peers are a preferred source of information on energy efficiency for students (Gollotti, 2009).

According to theories of persuasion (e.g. Petty and Cacioppo, 1986), message source is often just as important as its content and format in influencing attitudes and behaviour. Persuasive communicators must be trustworthy and attractive, and this may include those considered 'similar' to us. Social learning and identity theories (Bandura, 1971; Ellmers *et al,* 2002) also tell us that we learn about appropriate behaviour by observing

others, particularly those we identify with – in this case, fellow students and flat-mates. Studies also show that giving a verbal commitment to do something (including something energy-efficient) is a particularly effective form of eliciting behaviour change (e.g. Gardner and Stern, 2002) and can increase the likelihood of compliance in response to a future, larger request – the so-called 'foot in the door' technique (Snyder and Cunningham, 1975; Staats *et al*, 2004). The use of peers as communicators, and eliciting verbal commitment, were thus incorporated into the intervention design. No overlap with the existing student green rep scheme occurred as the scheme focussed on environmental action more generally, and had only been running for one academic year. Insights from the literature review were felt to be more appropriate for developing the intervention.

The intervention

An intervention was run in ten flats in the Leodis halls of residence (Figure 4): privately-owned halls containing eight identical blocks, each housing 15 flats of six residents, each flat separately metered for electricity. From January to June 2010:

- **Control**: students in five of the flats in one block received no peer-to-peer encouragement from student green reps.
- **Peer-to-Peer:** students in five flats from an alternative block were given intensive encouragement by a number of peer-to-peer reps recruited from within the residences and trained in energy efficiency and effective communication techniques.

The peer-to-peer reps were trained in good practice in encouraging others to adopt energy saving behaviours. They were supported by branded stickers and posters (Figure 5) to support core energy efficiency themes. Each representative was told to cover five themes on the core energy saving behaviours targeted within this project, each theme lasting three weeks. The focus of the scheme relied on the innovations of the peer-to-peer reps, who were encouraged to tailor the themes to the flats to allow a truly bespoke delivery of energy saving advice.

Whilst a green rep system is in place at Leeds University, the blocks within this ABR were selected as they were excluded from the green rep scheme and will not have been exposed to any other peer to peer stimulus, or other pro-environmental initiative within their halls of residence.

In each block, flats in the same location of the block were selected for both the control and the intervention groups in order to reduce variation in the thermal characteristics of the flats selected.

Sample: 60 students in Leodis halls of residence.

Figure 5. Leodis residences, University of Leeds

Figure 6. Example *Energy Watch* poster (left) and in place, Leeds

2.1.3 Efficient university and halls – UCLan

Existing initiatives and past research

The motivational effect of a low-carbon university and energy-efficient halls of residence has been highlighted in several studies. Research shows that students who feel their University is not taking action on carbon emissions, or that their halls are wasteful of energy beyond their control, are less likely to save energy themselves (Loughborough University, 2004). Research in this area provides divergent predictions on the impacts of information about energy-efficient infrastructure change (e.g. low-carbon buildings) on residents' behaviour. On the one hand, we may expect students who are told they are living in energy-efficient residences to feel part of a collective effort to address climate change and dwindling resources, and therefore to adopt *more* energy-efficient behaviours. However, this would likely depend on residents identifying to some degree with the wider university or the residence managers implementing the infrastructure changes (cf. Rabinovich *et al,* 2010). On the other hand, there is evidence that installing energy-efficient products may lead residents to *use more energy* because they have lower bills or because they feel more able or entitled to do so. This is known as the 'rebound effect' or 'licensing effect' (e.g. Herring and Sorrell, 2008; Mazar and Zhong, 2010).

The intervention

The University of Central Lancashire (UCLan) is a key university in terms of green initiatives. UCLan uses a number of private providers of university accommodation, including Quintain, who have a strong environmental policy and ensure that all university blocks meet very high environmental standards. UCLan also has a number of university-owned halls of residences, some of which date from the 1970s and have much lower environmental standards accordingly. Historic research (NUS, 2008) has shown that students say they would feel more motivated to conduct energy-efficient behaviours if they were aware of the energy-efficient efforts of their university and halls of residence. The UCLan interventions aimed to test this proposal by comparing the success of interventions at a relatively efficient halls of residence (IQ Kopa, provided by Quintain) and a relatively energy inefficient halls of residence (Roeburn, university-owned halls; Figure 7).

Figure 7. iQ Kopa (left) and Roeburn, UCLan

From January to June 2010:

- **Controls**: Students in two flats of each (both IQ Kopa and Roeburn) received no information about how green the university and the halls are;
- **Efficient Hall - University information**: Students in two flats of iQKopa received regular upbeat communications about how green the university is in the form of branded flyers (Figure 7);
- **Inefficient Hall - University information**: Students in eight flats in Roeburn received regular upbeat communications about how green the university is in the form of branded flyers
- **Efficient Hall - Hall information**: Students in two flats of iQKopa received regular upbeat communications about how green the halls they are living in are in the form of branded flyers;
- **Inefficient Hall - Hall information**: Students in eight flats in Roeburn received regular upbeat communications about how green the halls they are living in are in the form of branded flyers;
- **Efficient Hall - Hall & University information:** Students in two flats of iQKopa received regular upbeat communications about both how green the university is and how green the halls they are living in are in the form of branded flyers.

- **Inefficient Hall- Hall & University information:** Students in eight flats in Roeburn received regular upbeat communications about both how green the university is and how green the halls they are living in are in the form of branded flyers.

Sample: 159 students comprising 49 students from Kopa and 112 students from Roeburn

Figure 8. *Energy Watch* flyer, UCLan

2.1.4 Comparative and competitive schemes – University of Bradford

Existing initiatives and past research

These initiatives play on the competitive element of students living in halls of residence. At the time of conducting this research, the evidence showed that providing comparative feedback is an effective tool to motivate employees to become more energy efficient (e.g. Siero *et al*, 1996). Within the last four years a number of halls competitions have been successful in reducing energy consumption compared to the previous year. Although many of the competitions have small prizes as an incentive, there is evidence to suggest that the comparative element between halls is a key motivational factor, building on the strong community bonds within halls through inter-halls competitions (e.g. Loughborough University, 2004). One US study found students in halls of residence cut their energy use by 56% in response to a competition and informational feedback via smart meters (Petersen *et al,* 2007). Research has also found that feedback from peers, experts and those in authority can be influential in reinforcing the need to perform the desired behaviours (Dahlbom et al, 2009). There is good evidence that providing comparative feedback relative to one's own past behaviour, or to a comparison group's behaviour, is an effective tool to motivate

employees, home-owners and students to become more energy-efficient (e.g. Siero *et al*, 1996; Rabinovich *et al*, 2010; Brandon and Lewis, 1999). Often recipients are unaware of this effect (Nolan *et al*, 2008). However, this approach only works under certain conditions, as using comparative information can lead to a 'boomerang' effect, whereby those who consume less than the norm will tend to *increase* their energy use; while whose who do not identify with the comparator group will tend to ignore such information or react by acting differently to the implied norm (Rabinovich *et al,* 2010). In other words, implicit in norm-based messaging is how people *like you* are acting and should act; so using this approach effectively demands knowledge of who the target audience identifies with. The current intervention drew on this previous research by utilising comparative feedback to motivate group (flat) behaviour change.

The intervention

An experiment was run in six floors of two separate halls of residence (University Halls and Bradford Halls), each containing 22 student flats separately metered for electricity by floor. From January to June 2010:

- **Control:** Students on two floors at Bradford Halls received no information about their energy usage;
- **Comparative:** Students on two floors at University Halls (Figure 8) received weekly updates of their energy consumption compared to the previous week through notice boards in their kitchens;
- **Comparative & Competitive:** Students on another two floors at University Halls received both weekly updates of their energy consumption compared to the previous week plus comparative information about the energy consumption of the other floor in this cohort.

Sample: 168 students from University and Bradford halls (identical halls of residences)

Figure 9. University halls, Bradford

2.1.5 Financial incentives – University of the West of England

Existing initiatives and past research

A small number of halls providers have trialled financial incentives for saving energy. These include financial prizes through inter-hall competitions (University of the West of England), returnable energy deposits if students within blocks use less than a pre-determined amount of energy (Sheffield Hallam University; Unipol), and separately metering individual student rooms and charging students for the energy they use (University of Sunderland). Research identified at the time of writing highlights that energy conservation behaviours may be motivated by intrinsic factors such as environmental values, satisfaction or frugality (DeYoung, 1996) or extrinsic factors such as financial gain, and often a combination of both. However, the most common motivator would seem to be financial considerations (Brandon and Lewis, 1999; Defra, 2002, 2010; Defra/Brook Lyndhurst, 2007, 2009; Reeves, 2010; cf. Ek and Soderholm, 2010). In an English survey in 2003, Whitmarsh (2009), found that turning off unused lights is most often motivated by a desire to save money. Recent EST research (2010) has shown that the current economic recession is influencing consumers' willingness to save energy, with 65% saying they are more interested in energy saving for this reason. As noted in US research (Popovich *et al,* 2001), without financial responsibility for energy consumption, students report feeling entitled to consume as much as they wish. An evaluation of energy efficiency initiatives across Europe also found financial incentives to be a strong reinforcing factor when introducing new behaviours (Dahlbom et al., 2009). Thus, the current intervention aimed to examine the effect of a financial incentive on students' energy consumption.

The intervention

An experiment was run in Carroll Court (Figure 9) in nine houses containing six student flats using financial incentives[2]. Information was given to the intervention groups explaining how the incentive system worked (see Figure 10). Each house was separately metered for electricity through the installation of sub-metering through the distribution boards. From January to June 2010:

- **Control:** Students in three of the houses in Carroll Court received no financial incentive for saving energy;
- **Financial Ceiling:** Students in three of the houses received £5 each per month if they were able to keep their energy consumption below a 5% reduction;
- **Financial Variable:** Students in three of the houses were able to earn a variable cash payment based on the amount of energy saved, capped at £10 per month for a 10% reduction.

Sample: 54 students from Carroll Court.

[2] As part of a Greener Living Fund initiative, Degrees Cooler in collaboration with Student Switch-Off, ran inter-halls energy saving competitions for all accommodation blocks at UWE, with the exception of Carroll Court. The competition awarded cash prizes of £50-£100 per person for the block that saved the most electricity based on the previous year's energy data. A separate experiment was run in Carroll Court in nine houses containing six student flats looking specifically at financial incentives *without* the competition element. The intervention run for this research was completely independent of the Degrees Cooler initiative and was not impacted by it.

Figure 10. Carroll Court, UWE

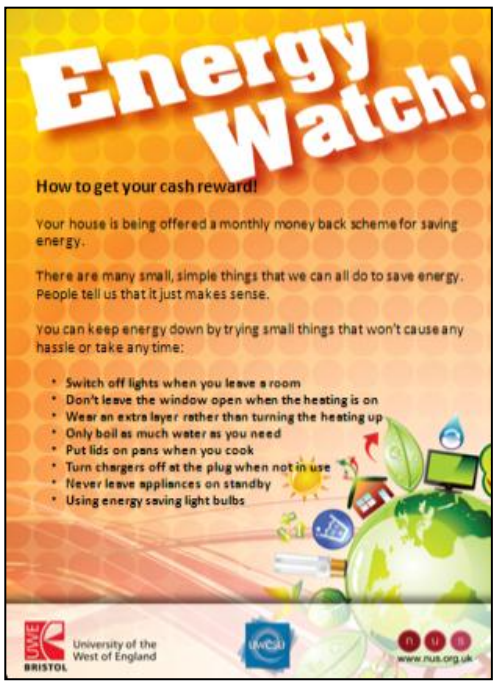

Figure 11. *Energy Watch* poster, UWE

2.1.6 Energy saving training

In order to further understand the implications of interventions that involve training members of the sample (e.g., peer-to-peer reps) in energy saving, practical energy efficiency training was delivered to a group of randomly selected students at each university in March 2010. This sample was *not* part of the main interventions described above (sections 2.1.1 to 2.1.5).

Twenty students from each of the five universities were invited to attend, making a total of target of 100 participating students. On the day, 129 students attended. Recruitment for these groups was random and targeted all year groups and Defra segments. Recruitment was delivered locally and turn-out for the sessions was very high. The energy saving training was designed consistent with the energy saving behaviours included as part of the interventions. A PowerPoint presentation was given, which covered:

- A broad discussion of existing knowledge of energy saving behaviours
- A discussion of the accessibility of different energy saving behaviours in different types of accommodation
- The magnitude of energy savings of different energy saving behaviours and their carbon and financial implications
- Individual formation of three promises to take forward into the future.

As part of the recruitment, students were asked to commit to two online focus groups to discuss the outcomes of the energy saving training. Reminders about these groups were circulated via email directly following training and two weeks before the follow-up focus groups were scheduled to take place.

2.1.7 Second year case study

For all interventions we included an examination of the durability of energy-saving habits formed in the original context of halls of residence (first year) into a new context of private accommodation (second year; see Figures 11 and 12 for details of follow-up survey and focus groups). However, we were also interested to explore to what extent the second year itself represented an opportunity to shape students' habits. To this end, an additional study to understand habit formation was designed in response to findings within the five interventions. Many students in halls described the lack of incentives for students to save energy when bills are included in their rent and an expectation that they would be more energy conscious when moving into private accommodation in their second year (see, e.g., section 3.1.1 Baseline attitudes). Thus we were interested to examine whether the transition from first year to second year (halls to private rentals) might represent a greater window of opportunity to influence energy habits than the prior transition from home to university. Thus, this case study allowed us to assess whether a further intervention in year two could help maintain, or generate further, energy saving habits.

The intervention

A small sample from Durham University – the general awareness campaign – who had been part of the intervention group in the academic year 2009/2010 was selected to receive further awareness raising materials. These materials comprised electronic communications in the form of branded HTML emails in the first term of the 2010/2011 academic year. Each student in the intervention group in the e-mail campaign received three emails, two weeks apart, highlighting energy saving habits and their relative savings. Each e-mail linked to further information on the Energy Saving Trust website. Email and web-based information were chosen as the information media in this intervention as these were most practical (i.e., students' addresses were known). Furthermore, Internet has been rated as amongst the two preferred sources of information (along with peers) for energy advice in previous research (Gollotti, 2009).

This email campaign was delivered to 58 students at Durham.

The impact of these communications was evaluated using one face-to-face focus group and a tailored section of the second follow-up survey in November 2010 and was not supported by meter data.

2.2 Data collection

2.2.1 Summary of methodology

A summary of the methodology and data capture methods used within this research is demonstrated in Figure 11 below, covering:

- Five main interventions, plus follow-up habit case study (Durham).
- Meter data from 695 students.
- 34 face to face focus groups run over three phases, comprising a total of 239 students.
- Energy efficiency training to a total of 129 students, with impacts and effects monitored through online focus groups.
- Questionnaire responses from 1,409 students living in halls of residence at the five universities.
- Online survey responses from 1,543 students from the wider HEI sector.

The Defra segmentation model was included in all primary research materials including in baseline and follow up questionnaires and within focus group discussion guides. The questions used to feed in to the allocation of segments were also asked to all students attending training as part of the interventions. All questionnaires can be found in Appendix 3, Focus group materials in Appendix 4 and the online discussion group guide in Appendix 6.

Given the range of research questions, a mixed methods approach was adopted. Using multiple data collection methods also allows for triangulation of findings, enabling more robust conclusions to be drawn. Meter data was captured to measure intervention impact in terms of 'hard outcomes' and a combination of quantitative and

qualitative data was collected to support the less tangible measures of behaviour change. The qualitative data also exposed motivators for and barriers to energy saving behaviours.

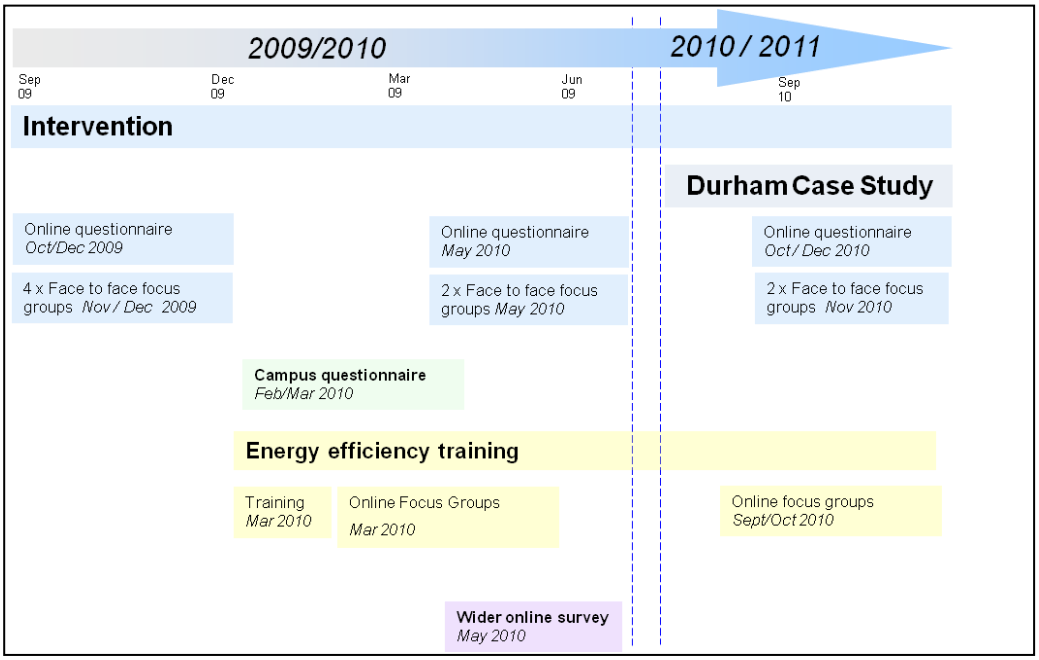

Figure 12. Methodology summary

2.2.2 Meter data

Meter data documenting electricity use in the controlled experiments was collected from each of the units specified within the interventions. A baseline period in the first term was established in order that the activities of the student sample were understood prior to intervention. To ensure that freshers' week (the first week of term in which courses have not yet begun in earnest but social events are widely promoted) did not bias energy consumption analysis through misrepresentative student activity, this week was excluded from the baseline data.

To understand the relative effectiveness of each intervention and for quantification of their impact on reducing energy use, meters were read and recorded once a week throughout the study period to allow for temporal identification of which specific components of each intervention were most effective in persuading people to change behaviour. By monitoring the data each week we were able to identify whether any of the interventions were not delivering the changes we expected and to reconsider or redesign if required (see section 2.5 Limitations). Data was analysed on a per head basis. Please note that each building will carry its' own thermal characteristics and technical evaluations of this was not considered.

A feasibility study ensured that the behaviours focussed on within this research (see section 2.4.4 Selecting energy saving behaviours) were all within the control of the students within the sample, however at Durham, Bradford, and UWE, heating was via gas or oil central heating rather than electric heating. Consumption of oil and gas was

not monitored as part of this study except at Durham but no comparison was made. The electric heaters at Leeds and UCLan were *not* storage heaters. Furthermore the u value of the windows at each institution are not known. Therefore some variation in energy use per head is noticed *across* interventions, however the accommodation was selected to minimise the variation in energy usage *within* institution, meaning that trends and percentages within institutions can be analysed with some confidence.

2.2.3 Quantitative survey data

In addition to meter data, quantitative survey data was collected at multiple time points (see Figure 11) in order to record changes in self-reported attitudes, behaviours and habits throughout the course of the research. This involved three stages of data collection with intervention and control groups, as well as two additional student surveys (to provide comparative data). The survey data collection methodology is detailed in Figure 13 where ++ means very robust, + means robust and – means less robust.

Name	Timing	Sample / Aim	Sample size	Data Robustness (++/--)
Baseline questionnaire	Oct-Dec 2009	Students at participating universities who were part of the research interventions (i.e., both intervention and control groups). Questions addressed pre-intervention attitudes, behaviours and habits.	191	Data generated through questionnaire (+). Quantitative analysis, however sample universe is relatively small.
Post-intervention survey	May 2010	Students at participating universities who were part of the research interventions (i.e., both intervention and control groups). Questions addressed post-intervention attitudes, behaviours and habits. Questions regarding the intervention were only asked to the intervention groups and were tailored to each university.	185	Data generated through questionnaire (+). Quantitative analysis, but sample universe was relatively small.
Follow-up survey	Oct-Dec 2010	Students at participating universities who were part of the research interventions (i.e., both intervention and control groups). Questions addressed durability of change in attitudes, behaviours and habits. Questions regarding the intervention were only asked to the intervention groups and were tailored to each university. The Durham 'habit persistence'	101	Data generated through questionnaire, but lower response rate, particularly for the second Durham intervention (+). Quantitative analysis.

		case study sample was also specifically addressed and responses were gained regarding the suitability, usefulness and impact of the case study materials.		
Campus questionnaire	March 2010	All residential students at participating universities NOT participating in interventions. Baseline questionnaire repeated to establish comparability, scalability, and wider perceptions/trends beyond the intervention groups.	1409	Data generated through questionnaire (++). Quantitative analysis.
National questionnaire	May 2010	All UK students who are NOT part of the research interventions. Baseline questionnaire repeated using NUS Services' student research mail base (40,000 names of students at HEIs throughout the UK) to widen the project's evidence base	1543	Data generated through questionnaire (++). Quantitative analysis.

Figure 13. Summary of survey data methodology

Quantitative data collection broadly followed Defra's guidance on managing and promoting surveys (see Appendix 2). Some modifications to this survey were made in the context of this research project. Recruitment for the campus and national surveys, however, were promoted locally through local student unions, and the national survey was sent to 10,000 students on the NUS Extra mailing list, resulting in 1,543 responses.

Online questionnaires were used partly for reasons of cost and time: Internet surveys are much quicker and most cost-effective to distribute and analyse than face-to-face or postal surveys. Furthermore, there is evidence that online surveys are no less reliable, and may even serve to reduce social desirability bias (relative to face-to-face surveys) (Duffy et al., 2005). In addition, since all students have an email address, there should be no sample bias in this choice of survey administration.

The questionnaire included items about behaviour, habits, Defra segmentation, and demographics to broaden the evidence base, whilst providing insight into a previously less well-evidenced population. Habits were measured using the widely-used and validated self-report habit index (SRHI; see Figure 14). This index has been developed based on the features of habit including history of repetition, automaticity and identity. The index has been widely test for reliability and validity and, given the focus of this research on understanding the interruption and formation of habits, was felt to be a key research tool. The three habits and 12 behaviours measured are described in section 2.4.4 (Selecting energy saving behaviours). The questions used to measure these are in Appendix 3.

(Behaviour X) is something …
1. … I do frequently.
2. … I do automatically.
3. … I do without having to consciously remember.
4. … that makes me feel weird if I do not do it.
5. … I do without thinking.
6. … would require effort not to do it.
7. … that belongs to my (daily, weekly, monthly) routine.
8. … I start doing before I realize I'm doing it.
9. … I would find hard not to do.
10. … I have no need to think about doing.
11. … that's typically 'me'.
12. … I have been doing for a long time.

Items are accompanied by response scales anchored by agree – disagree, with five or more response categories

Figure 14. Self-Report Habit Index (Verplanken & Orbell, 2003)

2.2.4 Qualitative data

The intervention samples at each university were also qualitatively assessed throughout all phases of the project. This involved face-to-face and online focus groups at four time points (see Figure 10) to collect crucial in-depth insights into: the range and drivers of energy use behaviours, the reasons why behaviour had (or had not) changed, and reflections on the interventions.

The baseline focus groups were delivered to both control and intervention groups. Following implementation of each intervention, focus groups focussed on those within the intervention groups only to ensure maximum insight into intervention impact. A control group from Leeds University was taken during the second round of follow-up focus groups in term four, to validate the hypothesis that without intervention, student attitudes and energy-efficient behaviours would remain the same, or slightly decrease over time as a result of a lack of cues to encourage energy-efficient behaviours. The qualitative data methodology is summarised in Figure 15.

Name	Timing	Sample / Aim	Sample size	Data Robustness (++/--)
Baseline focus groups	Nov-Dec 2009	Students at participating universities who were part of the research interventions (i.e., both intervention and control groups). Focus groups comprised 6-10 people invited from control and intervention conditions prior to initiation of interventions, with the	97	Data generated through focus groups (+). Qualitative analysis.

		aim of understanding existing attitudes, behaviours and habits.		
Post-intervention focus groups	May 2010	Students at participating universities exposed to the interventions (i.e. not the control group). Focus groups comprised 6-10 people invited from the intervention conditions only, with the aim of understanding changes in attitudes, behaviours and habit adoption. Questions regarding the intervention were tailored to each university.	81	Data generated through focus groups (+). Qualitative analysis.
Follow-up focus groups	Nov 2010	Students at participating universities exposed to the interventions (i.e. not the control group) plus a control group at Leeds. Focus groups comprised 6-10 people invited from the intervention conditions only, with the aim of understanding whether changes in attitudes, behaviours and habit adoption endured after leaving halls of residence (i.e., into their second year). Questions regarding the intervention were tailored to each university. The Durham 'habit persistence' case study sample was questioned specifically to understand awareness, impact and potential improvements as part of a longer-term intervention.	61	Data generated through focus groups (+). Qualitative analysis.
Online focus groups (Behaviour adoption phase)	Mar 2010	Those at participating universities who took part in the energy saving training. Online focus groups were run following the training to understand the immediate effects of encouraging energy saving behaviours.	40	Data generated through online focus groups (+). Qualitative analysis.
Online focus groups (Behaviour persistence phase)	Nov 2010	Those at participating universities who took part in the energy saving training. Online focus groups were run 6-7 months after the training to understand the any enduring effects of encouraging energy	15	Data generated through online focus groups (+). Qualitative analysis.

saving behaviours.

Figure 15. Summary of qualitative data methodology

Qualitative recruitment followed a similar pattern to the quantitative research, comprising two HTML email invites, followed by in-person recruitment. Incentives of £40 were paid for participation and groups were scheduled at convenient times.

Focus groups were semi-structured and followed a core interview protocol (see box below), followed by tailored questions about the interventions in place at each university:

- Understanding of and concern for environmental issues and energy saving
- The electrical appliances students have at university
- The energy-efficient behaviours students currently conduct
- A typical day for the students
- The reasons why students currently engage in energy-efficient behaviours
- The benefits and disadvantages of such behaviours
- When students began such behaviours and what influenced this
- Whether students consider the behaviours to be habits
- Any recent changes in energy-efficient behaviours e.g. since starting university
  - In the second follow-up this includes behaviours students might begin and behaviours they started but gave up
- How other students behave and whether they try to influence others
- Students' opinions on paying a fixed fee that includes energy costs versus paying separate utility bills based on usage
- Whether students are aware of environmental initiatives run by the university
- To what extent students think their university should take action on environmental issues
- Specific questions regarding the upcoming, current or past intervention

2.3 Sampling

2.3.1 Sample sizes

Sample sizes from each data collection method are shown in Figures 12 and 14, above. Details of the recruitment methodology can be found in Appendix 2.

Outcomes data (meter readings)

Outcomes data was based on meter readings, covering the full 695 study population, which enables us to make limited statistical comparisons and to draw conclusions as to the effectiveness of each intervention both at the local level and across the five university populations.

Qualitative data

A total of 239 students were sampled throughout the qualitative assessment process. Due to attrition of attendees, no focus groups were completely replicated throughout the research process. Where original participants dropped out, new participants were invited to attend.

Quantitative survey data

Quantitative data from the samples are again, given the small sample sizes, able to provide indicative results in student trends in terms of the Defra segments and reactions to the interventions, with a total of 477 responses from those in the intervention and control groups over the longitudinal timeframe. A further 1,409 respondents completed the wider campus survey and 1,543 completed the national student survey.

Figure 16 describes the full sample within this research, with the total universe for each wave shown where known.

Please note that due to the small sample universe and the relative response rates at each university, quantitative data from any of the intervention groups represents too small a sample size to be deemed representative. Therefore all findings from quantitative research are to be regarded as indicative.

Data Capture Tool	Halls Sample	Energy saving training sample	Campus Sample	National Sample
Baseline survey (n=191 / 695)	X			
Baseline focus groups (n=97 / 695)	X			
Energy saving training (n=100)		X		
Online focus group (n=40 / 100)		X		
Campus survey (n=1409)			X	
Follow up survey (n=185 / 695)	X			
Follow up focus groups (n=81 / 695)	X			
National survey (n=1543)				X
Follow up survey 2 (n=101 / 695)	X			
Follow up focus groups 2 (n=61 / 695)	X			
Online focus group 2 (n=15 / 100)		X		

Figure 16 - Summary of sample sizes

Recruitment

Quantitative data

Quantitative data collection broadly followed Defra's guidance for managing and promoting surveys (see Appendix 2). Some modifications were made in the context of this research project:

- It was not possible to personalise HTML recruitment e-mails due to ownership of the mailing lists – without owning these within NUS Services, the HTMLs could not be personalised and it was not possible for the universities to give permissions for ownership of these lists over to NUS Services without breaching the DPA 1998
- Where paper methods of recruitment were suggested on the 5 stage process, an electronic replacement was issued given existing data within NUS Services indicating that electronic, web based communications have a higher penetration rate amongst the student demographic than other materials
- Some in person recruitment was used in the 'thank you' stage of the process during the baseline and intervention close surveys; those who had already participated were thanked and those who had not were verbally encouraged to take part. This was not possible during the retrospective survey due to the disparity in accommodation locations.
- During the baseline recruitment phase, given that there was no cash incentive, chocolate incentives were employed, with a link to the survey attached. These demonstrated considerable success.
- During subsequent survey recruitment within the halls sample, the same process was followed, however rather than issuing chocolates, a £1000 cash prize draw was used to incentivise survey completion.

Recruitment for the campus and national surveys, however, were promoted locally through local student unions, and the national survey was sent to 10,000 students on the NUS Extra mailing list, resulting in 1,543 responses.

Qualitative data

Qualitative recruitment followed a similar pattern to the quantitative research, comprising 2 HTML invites, followed by in person recruitment.

On the day reminders were sent via e mail and text message to prevent excessive and unexpected on the day drop outs following the first wave of baseline focus groups.

In the first wave of baseline focus groups, held at Bradford University, on the day turnout was poor; despite full recruitment, only about 25% of respondents attended.

The incentives were increased from £10 to £40 (in line with consumer research in the North of England) in order to address the challenge of on the day drop outs, and a 50% over-recruiting was put in place (rather than the 20% employed in the first phase).

Additionally the timings of the focus groups were reviewed and the data collection periods for all waves of qualitative research was extended such that the groups could be fitted into Wednesday afternoons (sports afternoons) and evenings, following lectures so as not to request that respondents attend focus groups at the cost of their lectures.

These measures in combination supported the recruitment and on the day dropout was much reduced.

Energy saving training and online focus groups

Recruitment for these groups was random and targeted all year groups and defra segments. Recruitment was delivered locally and turn out for the sessions was very high.

As part of the recruitment, students were asked to commit to two online focus groups to discuss the outcomes of the energy saving training. Reminders about these groups were circulated directly following training and two weeks before the initiation of the habit persistence online focus groups via e mail.

2.3.2 Sample representativeness

In order to avoid sample bias, the quantitative survey data was analysed to compare intervention and control groups with the broader participating university and national student populations to ensure no significant differences existed prior to intervention.

Baseline versus campus surveys

Twelve behaviours were chosen as indicators of energy efficient behaviour, detailed in 2.4.4 and shown below:

- Turn the heating off when you go out for a few hours
- Put more clothes on when you feel cold, rather than putting the heating on or turning it up
- Turn off lights when you are not in the room
- Turn your TV off at the plug rather than leaving it on standby for long periods of time
- Turn your computer off at the plug rather than leaving it on standby for long periods of time
- Not leaving a mobile phone charger switched on at the socket when not in use
- Fill the kettle with only as much water as you are going to use
- Put pans on lids when cooking on the hob
- Wash clothes at a low temperature setting (less than 30 degrees)
- Leave clothes to dry naturally rather than tumble drying
- Keep windows closed whilst your heating is on
- Purchase energy saving light bulbs rather than standard bulbs

The majority of universities have broadly similar results for behavioural frequency amongst students within the baseline and campus surveys. However, there are some minor differences:

- At UWE (the financial incentive intervention), the baseline survey has a higher number of students selecting 'Always' and 'Sometimes' for every behaviour, compared to the campus as a whole.
- At Bradford (the comparative and competitive intervention), the campus survey has a higher number of students selecting 'Never' for some behaviours.
- At UCLan (the Efficient halls and university information 1 intervention), the baseline survey has a higher number of students selecting 'Never' and 'Sometimes' for several behaviours.

These small differences could be explained by the differences in response rates between the two surveys. Overall, the similarity of responses shows that the baseline samples at the five universities are broadly representative of the wider campus in terms of current behaviours.

The Self Report Habit Index was used in every quantitative survey to understand any changes in the strength of habit over three core energy-efficient behaviours – boiling only as much water as needed, turning lights off when leaving the room, and turning the heating off when leaving the house for a length of time. The graphs in Appendix 7 show average overall scores for three habits, measured using an agreement scale with a set of statements such as 'I do frequently'. Responses were scored such that a high score indicates an energy-efficient behaviour – in these cases *infrequently* leaving the heating on, leaving lights on and overfilling the kettle – and a low score indicates an environmentally negative behaviour – in these cases *frequently* leaving the heating on, leaving lights on and overfilling the kettle.

In terms of overall habits, generally the baseline and campus surveys at each university show broadly similar results, with participants' habits generally being either neutral or slightly energy-efficient.

Campus versus national student surveys

No significant differences were found between the samples within the national student and campus surveys, indicating that the universities selected for research were nationally representative in terms of energy-efficient behaviours and habit strength.

Comparison of universities

Overall, the five universities show broadly similar results in terms of current behaviours. Any differences tend to be on a question-by-question basis and do not appear to be systematic (see Appendix 8 for a comparison by question and over time). Many of the differences are likely to be due to differences in response rates, with Leeds and UWE having particularly low numbers of respondents.

The universities are broadly similar in terms of habits (see Appendix 9). However, there is a wider range of scores (i.e. less similarity) for 'leaving the heating on' and 'overfilling the kettle'. Although the majority of the results are very close, UWE (financial incentives) and UCLan (Efficient Halls and University information 1) show slightly more energy-

efficient habits and Leeds (peer-to-peer encouragement) and Bradford (comparative and competitive) slightly lower energy-efficient habits compared to the average.

Comparison with non-student sample

In order to provide an indication of how energy habits changed with the transition to university, relative to those not going to university, we examined data collected by Defra (2009) at a similar time (March 2009) as part of their regular public attitudes and behaviours surveys. This comparison helps us verify that the move to university can be seen as a moment of change, or a habit discontinuity.

A matched control group is not possible to use because there are likely to be differences between people who choose to go to university and those who do not which could account for differences in behaviour. Nevertheless, we can compare our student samples with the broader population of the same age (18-20) to indicate whether moving to university represents a moment of change. The Defra (2009) dataset is the closest dataset that fulfils this requirement, although the age band is wider than ideal (16-24). Figure 17 shows the average energy habits within the 16-24 age group across the UK, and those of the student samples within the project (averaged across all conditions) across the three survey time points. Data is normalised to enable comparison (i.e., because the two datasets used different frequency response scales, these have been standardised to a -1 to +1 scale where 0 is the indexed average). This shows relatively little difference in the energy habits of the two groups, with all three energy inefficient behaviours undertaken fairly infrequently. However, the difference (albeit small) is consistently in the direction of less frequent energy saving behaviour amongst the university sample. This disparity is consistent with the notion of going to university as a moment of change; however, since a matched sample was not available these results should only be seen as indicative.

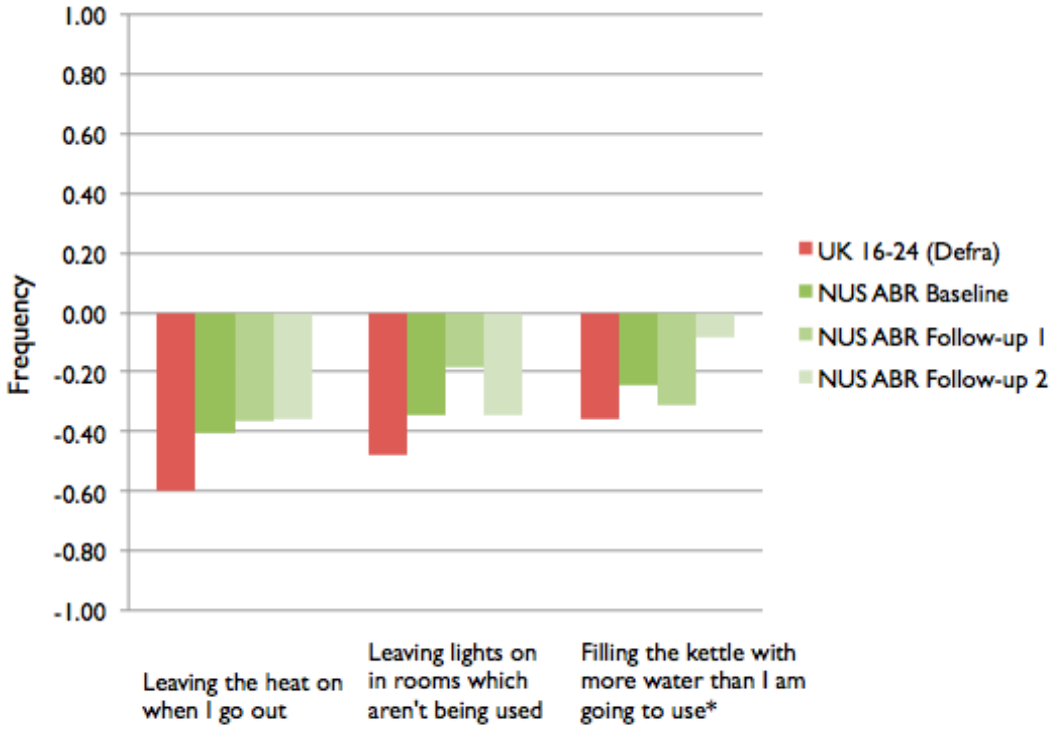

Figure 17. Comparison of research sample energy habits with broader population of equivalent age.

2.4 Project implementation

2.4.1 Creating the ABR teams

This work was run centrally from NUS Services, led by the Research Manager, a specialist environmental researcher. This project was reliant on building in the expert skills of the wider steering group and the team was regularly informed via weekly progress updates and steering group meetings to coincide with project milestones.

Each university implemented a local delivery team, a group of staff who were responsible for the local delivery of the scheme, and were kept updated about the research on a regular basis.

Research methods and analysis were overseen by Professor Bas Verplanken, University of Bath, and Dr. Lorraine Whitmarsh, Cardiff University, to ensure academic rigour.

2.4.2 Ethical considerations

To ensure that participation in the research was voluntary and consensual, students from the intervention and control groups were contacted via email prior to the start of term and asked to complete a consent form which provided information about the research in terms of its aims, methods and what participation would involve. All survey and meter data collected was anonymous; and all focus group data was confidential.

2.4.3 *Consistency across intervention sites*

Whilst the built environments surrounding the halls of residences chosen within this study are subject to variation, the living arrangements within were selected to ensure parity. Each accommodation offered study rooms to the same specification, incorporating a space for sleeping, working and washing, each offering a bed, desk and limited washing facilities (see Figure 18).

Figure 18. Study rooms in four sample flats.

Clockwise from top left: UWE, Leeds, Bradford, Durham

In addition, communal living was part of each of the interventions within this study, with each intervention block offering a kitchen space, and some degree of living space such as a TV and a sofa (see Figure 19).

Figure 19. Communal living

Clockwise from top left, UWE, Durham, Bradford, Durham

Furthermore, while the energy efficiency of the residences varied considerably across the five universities, within each site the intervention and control residences were selected to ensure they had the same insulation properties. Thus, while meter readings across the five sites cannot be directly compared, they can be compared between intervention and control conditions within each university.

2.4.4 Selecting energy saving behaviours

As per 2.3.2, a number of core behaviours were selected to cover behaviours accessible to all in the sample halls of residence and a feasibility study was undertaken to ensure that there were no exceptions to this. In keeping with Defra energy saving behaviours, a short list of 12 behaviours was targeted. Questions about the behaviours (see Appendix 3 for the actual questionnaires) were deliberately phrased in different ways in order to provoke consideration of each behaviour individually and avoid 'acquiescence bias' (i.e., the tendency to agree with questions or statements presented):

- Turn the heating off when you go out for a few hours
- Put more clothes on when you feel cold, rather than putting the heating on or turning it up
- Turn off lights when you are not in the room
- Turn your TV off at the plug rather than leaving it on standby for long periods of time
- Turn your computer off at the plug rather than leaving it on standby for long periods of time
- Not leaving a mobile phone charger switched on at the socket when not in use
- Fill the kettle with only as much water as you are going to use
- Put pans on lids when cooking on the hob
- Wash clothes at a low temperature setting (less than 30 degrees)
- Leave clothes to dry naturally rather than tumble drying
- Keep windows closed whilst your heating is on
- Purchase energy saving light bulbs rather than standard bulbs

To assess the degree to which behaviours had become habitual (i.e., automatic, frequent, and linked to identity), the Self Report Habit Index (SRHI) was used with respect to three common behaviours:

- Heating: Controlling the heat in the room
- Lighting: Turning lights off
- Cooking/drinking: Filling the kettle with only as much water as is required

2.4.5 The 'Energy Watch' brand: Providing consistent information

In order to ensure that the interventions were both consistent and effective across Defra segments, a brand was developed to appeal broadly to students and offer engaging, motivating intervention support and delivery.

Content was developed which was sensitive to contextual factors, incorporating seasonal changes into the timings and content, and reacting to core fixtures in the student year, including exams and end-of-term socialising.

The choice of posters, stickers and flyers for the first year Energy Watch communications was partly a practical one: email addresses within each flat were not known, making paper-based communication more appropriate than electronic. At the same time, there is a good scientific argument for using these communication media: using stickers and posters enabled the university delivery teams to, where possible, position the information at the location where the behaviour would be carried out, hence providing more timely and targeted information.

2.4.6 Managing the interventions

Following a baseline data collection period in term one (September–December 2009) interventions were rolled out in January 2010, term two.

Each university was provided with the materials, typically to the residences teams, excluding University of Leeds where the peer-to-peer representatives received the materials. The team leaders were given a written plan including core themes, delivery dates and placement of materials. Of the teams requiring weekly updates (Bradford and UWE) these were managed from NUS Services and delivered to the teams locally once per week.

2.5 Limitations

It is useful to be aware of the following limitations before reading the main findings. The limitations include reflexive learning i.e. the reactions to the project delivery which resulted in an adaptation to the proposed methodologies, and reflective practices i.e. the process of regular steering group review and discussion which resulted in an adaptation to the proposed methodologies and are within three broad categories: research design; local delivery; and university-specific limitations.

2.5.1 Research design

Sample

A small universe of students was used within this research; each intervention site offered limited numbers of students, and the numbers at each site were limited by the infrastructure at each institution in terms of the ability to install energy meters which would reliably provide meaningful data. Meters were installed bespoke to this research at Bradford, UCLan Leeds and UWE:

- Bradford – wiring allowed for meters to be monitored at a floor level (28 students per meter)
- UCLan – wiring allowed for meters to be monitored at a flat level (6 students per meter in Kopa, 14 students per meter in Roeburn)
- Leeds – wiring allowed for meters to be monitored at a flat level (6 students per meter)

- UWE – wiring allowed for meters to be monitored at a house level (6 students per meter

Metering at Durham was already in place at a building level and wiring prevented metering smaller student groups (58 students per meter excluding Tees block, 100 students per meter)

Action research is labour- and resource- intensive and to ensure consistency of approach and ability to liaise well with each site, sample sizes at each institution varied as a function of resource.

Therefore in terms of representativeness, the quantitative data should be interpreted with caution. The qualitative data in which the issues at each university were explored in depth can help offer more meaningful insight into the scalable outcomes of the project than the quantitative research.

Additionally, the first year at university represents a tumultuous period of an individual's life, typically peppered with new experiences in term one, a semblance of routine in term two and concluded with exams in term three. Therefore the context of each wave of data collection differs considerably and attitudes can change significantly over time as a result of such external pressures.

The project reach extended to the student population, however did not cover those of demographics mirroring those of this sample who chose not to attend university and were living away from home for the first time. Therefore further work could be conducted to understand whether habits were disrupted by the move to university through a control of people of roughly the same age and segments who had not moved into halls or moved at all. This would have tested the hypothesis that energy message have a greater effect during a window of opportunity in which habits are disrupted.

Furthermore, in the context of work concurrently conducted for Defra's Greener Living Fund[3], which focussed on the student lifestyle in terms of some key pro environmental behaviours, little focus was given within this research to the typical student lifestyle, although the typical student day was assessed in terms of the opportunities within this to save energy. This project was not intended to be a socio-technical study of energy, however further work could be conducted to understand perceptions of nonphysical use of energy.

As with most methods of attitudinal data collection, participation is voluntary. Therefore responder bias may be evident. The presence of incentives (see quantitative and qualitative data collection sections below) may have skewed participation in terms of socio-economic background; however this is not felt to be inconsistent with other robust research methodologies. Furthermore the incentive process is likely to have encouraged those who did not have strong opinions on the topics to participate where they otherwise may not have. Please note that no non-responder data was captured to validate the samples in any of the methodologies described below.

Quantitative data collection

[3] Please see footnote 2 on page 14 for full explanation of the Greener Living Fund project.

Considerable efforts were taken beyond Defra's guidance for managing and promoting survey process (Appendix 2) in order to gain representative participation in the quantitative research. Each local delivery team called on its own resources to engage those within each sample in completing quantitative surveys including chocolate incentives, local booths to allow for completion of surveys on laptops and announcements at mealtimes. However the first year at university is incredibly busy and feedback from students was that research was completed online only around other commitments. This is indicative of a lack of connection with the energy efficiency campaigns, and a lack of understanding of the value of completion, regardless of personal views surrounding energy consumption.

This difficulty in engaging students in the surveys persisted throughout the project, despite implementation of a cash prize draw to encourage participation. Feedback on the quantitative data collection obtained in qualitative focus groups reported that students felt that the surveys were burdensome and not a priority.

For this reason within the analysis, statistical analysis is not reported and statistical correlations are not drawn to ensure that the data in this report is understood as indicative rather than statistically significant.

Qualitative data collection

The baseline focus groups suffered from poor uptake, largely attributed to low initial incentives of £10 per person. Incentives were subsequently increased to £40 for later focus groups, which improved the attendance rate to ensure full sampling at each university, and also meant that follow-up focus groups were well attended and vibrant.

During phase one where response rates were low, in-depth interviews at Bradford and UCLan were applied. These partly overcame the sample size issues and elicited information free from social desirability bias and peer pressure. Indeed, this issue of social desirability is likely to be a particular relevant when conducting focus groups with groups of new students concerned about fitting in and making a good impression on their peers. Although not part of the original research design, in-depth interviews could thus prove useful within future similar research.

Lack of comparability between the results for the two Durham interventions

The extension Durham case study was designed to explore longevity of change prompted by information. However, a direct comparison is not possible as the form of each differs and no meter readings were taken for the case study intervention in the second year.

Lack of socio-economic data

It is difficult to gain accurate socio economic status with the student demographic, whilst it is possible to look at parental income, many students are unwilling or unable to disclose this, and it is rarely a direct measure of personal income. Students are low earners, but with the majority of them relying on loans as a main source of income, they have access to reserves of money, and therefore represent a paradox in terms of socio-economic classification. It was therefore not possible to segment the responses by socio-economic classification

'Double counting' of effects – overlapping behaviours and habits

All three habits measured by the SHRI are also included in the list of the behaviours. Therefore it is important not to place too much emphasis on the quantitative results as these behaviours are being over-reported.

Mis-match of behaviours covered by meter data and habits and behaviours

Both the behaviours and habits measured by the surveys include those controlling heat (e.g. Turn the heating off when you go out for a few hours). However in some of the case studies (Bradford and UWE) it was not possible to meter the energy related to heating (oil or gas). This means that there is a mis-match between the survey and energy use data in these cases.

Research timings

The timing of the baseline surveys was an issue, as the surveys were timetabled for before the start of term, but students' names and addresses could not be obtained by this date. Baseline surveys were instead conducted during the first six to eight weeks of the first term. This should not have significantly impacted the study in psychological or behavioural terms, however, as other research has shown that habits often take two or three months to fully develop, although certain routines will begin to form before this (Bamberg, 2006; cf. Lally et al., 2010).

Issues with recruitment for the baseline survey affected the timings of the interventions; the initial baseline survey recruitment was muted, so local students were paid to advertise the survey, meaning the interventions ran in the first part of the second term, rather than the end of the first term. Other issues with timing included the second set of quantitative surveys, which were timetabled for May. As this fell within the universities' exam period, there were reduced numbers of participants. These are issues that should be considered when running future research.

Context of research

Using a quasi-experimental design provided a considerable degree of control over the influences affecting participants' behaviour. In other words, our control and intervention groups were selected on the basis of having (as far as possible) the same living conditions and demographic characteristics. The only difference between the two groups should have been the intervention we provided. Although every effort was made to eliminate external influences on students' environmental habits and behaviours by asking universities to provide details of any environmental events or campaigns running during the period of study, it was not possible to eliminate all energy-related influences in the wider community. For instance, awareness campaigns may have been running in town centres. This could mean that improvements in habits and behaviours may not be entirely due to the interventions. In particular, other interventions such as the fire video shown at UCLan may have affected habits and behaviours. The fire video recommended that students turn appliances off due to fire risk and was mentioned by several UCLan participants within the focus groups and in depth interviews.

> "*Switching everything off because I don't want my room to be set on fire!*" Positive Green, UCLan in depth interview (22 Dec)

No action research is exempt from external influence, and the decision to move the Low-carbon university intervention from Lancaster University to UCLan was taken prior

to project initiation as a result of external funding for Green Lancaster (http://greenlancaster.org.uk/) which led to a number of high profile pro-environmental initiatives due for roll out at Lancaster University which would have impacted on the action research. Lancaster University had been selected for the BREEAM excellent halls of residences, "eco-halls", however following consideration that this branding could attract those from the more environmentally conscious Defra segments, UCLan was felt to be a more suitable university for the research, specifically using iQ Kopa's halls of residences which deliver excellent energy efficiency.

This has significant impact on scalability of findings for the sector, where HEFCE targets have driven development of pro-environmental schemes within institutions. Scalability of findings from the research needs to be considered as part of the rich texture of existing schemes within institutions, and must be positioned to support those responsible for accommodation.

2.5.2 Local delivery

Local delivery teams were in place at each university; however the engagement of all parties within the team is essential in driving forward consistent delivery of action research. Where teams were less engaged, under-resourced or a key opinion leader had influenced them negatively, a direct relation with reduced data capture quality was noted.

The individual universities within the study recruited local delivery teams to include people from varied backgrounds, meaning local delivery teams at different universities had a different make-up. NUS Services were unable to affect the selection of these teams and, although the same briefings were delivered at each university, they were interpreted differently by individuals from each university.

Despite NUS Services' best communication efforts, this did not become apparent until partway through the project, one of the consequences being that some groups were missed out of the surveys. Namely the second follow-up quantitative survey has no participants from Durham Control. This has complicated analysis of the effectiveness of interventions, particularly for Durham, as the main point of the study was to look at habit formation in year two, yet without control comparison the impact of the year two Durham intervention cannot be assessed.

Although feasibility studies conducted by NUS Services prior to the interventions confirmed that all the behaviours targeted were possible within each halls of residence, numerous students within the focus groups insisted that they were unable to do all the behaviours listed. This indicates that the local delivery of schemes needs to be expanded to include more focus on educating students about what they can do within their specific hall of residence to save energy.

Meter data

Meter readings were another local delivery issue. As local teams rarely made provision for meter readings to be taken during holidays, they were often late, despite NUS Services endeavouring to obtain them on time. Consequently, results had to be normalised for this. Additionally, as meter readings were generally only taken weekly, when there were issues with broken meters data was often lost in the intervening

period between the meter breaking and the reading that identified the broken meter being taken.

Staff at the University of Bradford were forced to reset meters after the meters proved to be located too close together and subsequently transmitting on the same frequency, providing identical readings between floors. An average energy use was subsequently calculated for Bradford based on the meter readings before and after any issues occurred and applied to the affected periods to normalise results.

2.5.3 Intervention methodologies

The delays to data capture (2.5.1) led to the baseline period lasting the entire duration of term one of this research. This afforded an opportunity for review of findings and thematic analysis of qualitative data prior to initiation of any of the five interventions. As a result deliverables were tailored to student expectations in terms of tone of voice and terminology:

> *"I think that we all know here what CO2 is, what carbon is. I don't know...if maybe you were an overseas student, you might not know"*. Female, Durham, Intervention

Additionally baseline findings showed a number of misperceptions with many students believing (incorrectly) that certain behaviours require a lot of effort or are time consuming.

This baseline understanding of student knowledge, attitudes and behaviours allowed for tailoring of materials, which proved a benefit of the delayed intervention start. However, other unforeseen issues emerged which affected more negatively the implementation of the different interventions, while also revealing interesting behavioural responses to the energy saving interventions:

Leeds

At Leeds, there was a notable variation in the behaviour of the student peer-to-peer representatives. All representatives were trained together with the same materials at the same time and by the research manager at NUS Services. Of the four reps, three created positive rapports with the students in the flats in which they were engaged, however one was less able to strike up this rapport.

Articulating this disconnect was difficult for the reps, who viewed the researchers as their managers and were consequently not completely honest about the success of their actions. For instance, in some cases the reps reported that the project had been a success and that they had undertaken extra activities, whereas the students living in the halls reported the opposite. In some case, reps did not appear to engage well with students and were often seen by students as intruding. Additionally, there were difficulties in getting volunteers with the right skill-set for the rep positions. This has led to questions surrounding how this could be scaled up at a national level and highlights issues that need considering within similar future research.

UWE

At UWE, there were several issues with the incentives within this scheme; the follow-up focus groups highlighted that several students saw the incentives as being too low to merit any behavioural change. Therefore, several students reported actively deciding

not to try and achieve the targets. It was suggested by some that non-financial incentives, such as cinema tickets, could have been more effective.

Durham

At Durham, the additional intervention was only recalled by 7% of survey respondents (n=4). As the questions were asked of all Durham students within the second follow-up study, it is unclear whether this low recall rate indicates that only a few students who were part of the additional intervention took part in the quantitative survey, or that only a small percentage of students within the additional intervention recalled it. Future research could capture the number of quantitative survey respondents that were part of the additional intervention and only ask questions regarding the additional intervention to relevant students. This would allow more detailed analysis of the effectiveness of interventions over time.

The Durham case study was not a direct extension of the ABR; respondents within the case study were subject to e-mail stimuli rather than poster encouragement, their meter data was not recorded and the housing situation of each respondent differed, although each were in privately rented accommodation. The purpose of this case study was to allow insight into the qualitative impact on attitudes as a result of continued energy efficient advice.

Bradford

At Bradford, the competitive intervention had an unexpected effect: several instances of students cheating were reported. In order to ensure that their floor won, some students admitted to visiting other floors and turning heating and appliances up in order to increase competitors' energy use. This utility maximisation response represents an issue with this style of reward-based intervention and has broader relevance in terms of designing effective energy and environmental policy (e.g., Dobson, 2003).

UCLan

At UCLan, due to the high number of groups (eight in total) many intervention groups had low numbers of respondents. Additionally, the six variations of the intervention were very similar, meaning analysis is complicated. Understanding why, within energy-efficient halls of residence, students who received information regarding the environmental performance of their halls behaved differently to students who received information regarding the energy performance of their university or of both their halls and their university, is complex. Overall differences between the energy-efficient and energy inefficient halls was possible and led to useful insights, but breaking the results down into the individual groups was less manageable and appeared less useful overall.

Understanding impact

The original proposal for research foresaw interventions being completed by the end of term three. However this left outstanding the issue of how new habits would endure over time during a tumultuous period of lifestyle change. Would behaviours adopted as a result of an intervention within halls of residences be transferred to a future setting? And could a further intervention in year two help maintain, or generate further, energy saving habits? An extension to the research was developed with a case study at Durham university to allow a small sample of individuals to continue the general awareness campaign after their time in halls in order to understand the on-going influence of the

campaign, and the changing needs of students entering their second year of university, where the majority will typically choose to rent a room in houses of multiple occupancy with private sector landlords. This new context is likely to have different behavioural implications for energy use, because energy bills are typically paid separately to rent (i.e., the amount of energy used now correlates to what is paid for).

2.5.4 Implications of limitations for research aims

These limitations of the research meant that it was not possible to fully address the research aims as listed in section 1.4. This is discussed in section 4 (What we learnt) but is summarised here.

The practical limitations of the research – in particular the small sample sizes impacted in particular on the first aim – to judge the effectiveness of different interventions. The limited quality of the quantitative data in particular meant that it wasn't possible to draw any conclusions about this. It also meant that it wasn't possible to assess which kinds of people responded best to which type of intervention.

The lack of socio-economic data from the students meant that it wasn't possible to perform a complete segmentation of the student responses (the second aim). However the qualitative data from the focus groups meant that the final aim (To understand the most appropriate ways of targeting university students in terms of encouraging pro-environmental behaviours for the future) was met,

3 WHAT WE FOUND

This section describes what was found through the multiple methods of data capture used within this research. The section outlines:

- What student attitudes, behaviours and habits were *before* and *without* intervention;
- How the different interventions impacted student attitudes, behaviours and habits, qualitatively and quantitatively; and

3.1 What are student energy efficiency attitudes and habits in halls without intervention and why do they exist?

Analysis of the baseline data allows an insight into the behaviours of those students within halls of residences in their first year at university *prior* to being exposed to the interventions. This can act as an indicator of the scalability of findings insomuch as describing the *degree* of change afforded by the action research, and can also shed light on the how young people's energy behaviours are shaped (e.g., by parents, school).

Throughout findings, consideration of the Defra segmentation is taken. One key aspect of this research was to look at how the interventions had affected different types of students, according to Defra's seven segmentation types. In several of the tables within this report, the segmentation types are grouped as follows in order to allow meaningful analysis:

- **More engaged** = positive greens, cautious participants and concerned consumers
- **Less engaged** = honestly disengaged, sideline supporters, stalled starters and waste watchers

Furthermore, analysis of specific demographics is deliberately focused on gender and home status, with consideration of socio-economic group excluded. It is difficult to gain accurate socio economic status with the student demographic, whilst it is possible to look at parental income, many students are unwilling or unable to disclose this, and it is rarely a direct measure of personal income. Students are low earners, but with the majority of them relying on loans as a main source of income, they have access to reserves of money, and therefore represent a paradox in terms of socio-economic classification.

Please note that all quotes within this document are used with permission. All participants signed permission forms which gave permission for quotes to be used in an anonymised format for the purposes of this report only.

3.1.1 Baseline attitudes

Students within the control and intervention groups started university with a baseline of energy-efficient behaviours and habits instilled through a combination of **parental**

insistence in the home and **education** both in school and further education. Indeed, many students identified parental insistence or school influence as the reason for adopting energy-efficient behaviours at home.

> "*I've done it since quite a young age, even younger than the age of 10 my dad would tell me off for leaving the tap running when brushing my teeth. It's turned out to just be a habit*" Positive Green, Leeds, Baseline Focus Group
>
> "*It's like part of the syllabus to learn about the greenhouse effect*" Positive Green, Leeds, Baseline Focus Group
>
> "*I went to, like, a really, really green school, where our head teacher would walk down the corridors, shouting about lights being left on"* Cautious Participant, UWE, Baseline Focus Group

Generally, parental influence was deemed due to financial rather than environmental reasons.

> "*At home I'd turn lights off and recycle, but that's because we're paying for it*" Concerned Consumer, Durham, Follow-Up Focus Group (Intervention)
>
> "*At home when I turn things off it's because my Mum would be like you're wasting money, rather than harming the planet*" Honestly Disengaged, Durham, Follow-Up Focus Group (Intervention)

Once parental insistence has been removed, however, some students rebel and behave in the opposite way while in halls, in effect licensing energy inefficient behaviour (see also section 2.1.3 Efficient university and halls – UCLan).

> *"My Dad is always at me for leaving stuff on; we live in a pretty small flat in London, [and] I've been yelled at for leaving the TV on when I've gone to my room for, literally, two minutes. At uni, no one has a go"* Honestly Disengaged, UWE, Baseline Focus Group

This is exacerbated by most students having all-inclusive bills in halls, which are a strong disincentive to save energy (particularly where parents have instilled a *financial* motive for energy saving). For instance, many students in the baseline focus groups stated that they felt entitled to use as much energy as they wanted within halls, having already paid what is perceived as a high fixed fee for their accommodation and bills. Therefore, the strength of energy-efficient habits and frequency of energy-efficient behaviours tends to decrease during students' first year in halls.

> "*…you just leave stuff on, because you're not paying for it. I think that I've paid for it so I deserve to have it on*" Sideline Supporter, Leeds Baseline Focus Group
>
> "*I think this year I've taken advantage of the fact energy is included; next year I'll be more cautious*" Positive Green, Leeds Baseline Focus Group
>
> "*I think in private residence you're a lot more cautious of energy usage, if you're personally responsible for paying for it you're a lot more cautious about things*" Honestly Disengaged, Leeds Baseline Focus Group

These remarks indicate that due to a disconnect between energy use and bills, limited cues exist to support students forming (or retaining) energy-efficient habits whilst living in halls of residence. This may have implications for establishing longer-term habits, since living away from home for the first time may be a crucial habit-forming stage of students' lives.

In contrast to the above comments, but consistent with the categorisation within the Defra segmentation model, some students reported feeling that they had a responsibility to save energy now they were at university.

> "*It feels like the responsible thing to do*" Positive Green, Leeds Baseline Focus Group
>
> "*I think I've become more responsible [since coming to university]*" Concerned Consumer, Leeds Baseline Focus Group
>
> *"I feel more inclined to do these things [energy-efficient behaviours] now no-one is making me"* Cautious Participant, UCLan, Baseline Focus Group

3.1.2 Baseline behaviours and habits

Figures 19 and 20 outline the baseline position of each group – i.e. their level of energy-efficient habits and behaviours prior to the interventions (the results for over time are also in Appendix 8 for behaviours and in Appendix 9 for habits). This is useful as an initial picture of differences between the universities and between the intervention and control groups.

Analysis of habits is based on the HSRI, whereby a high score indicates little or no habit in a particular energy behaviour and a low score indicates a strong habit in a particular energy behaviour. Within this report therefore, a low *habit* score indicates that the energy efficient behaviour is a strong habit,

Conversely, analysis of behaviours is based on frequency of conduction, therefore a high score indicates a high frequency of conducting that behaviour, and therefore energy efficient behaviours that are frequently conducted are associated with a high score.

For the following table, a score of 15 indicates the most energy-efficient score and a score of -15 the least energy-efficient score. Colour coding is intended to assist with interpretation: dark green indicates the highest scores i.e. the most energy efficient, followed by light green and light red, through to dark red indicating lowest scores.

	Leave the heating on when you go out for a few hours when no one else is in	Put more clothes on when you feel cold, rather than putting the heating on or turning	Leave lights on when no one is in the room	Leave your TV on standby for long periods of time	Leave your computer on standby for long periods of time	Leave a mobile phone charger switched on at the socket when	Fill the kettle with more water than you are going to use	Put lids on pans when cooking on the hob	Wash clothes at a low temperature setting (less than 30 degrees)	Tumble dry clothes rather than leave to dry naturally	Leave your window open whilst the heater/heating is on	Purchase energy saving light bulbs rather than standard bulbs	Overall
Bradford Comparative	0.63	-0.56	6.11	15.00	5.00	10.71	5.83	0.83	-1.67	1.11	5.00	1.43	4.12
Bradford Competitive	3.33	5.00	10.71	7.50	5.00	10.00	9.29	0.00	4.00	-7.14	2.86	5.00	4.63
Bradford Control	*-4.17*	*5.00*	*11.54*	*13.00*	*1.82*	*9.23*	*8.18*	*12.78*	*-1.67*	*-1.00*	*5.00*	*3.13*	*5.24*
Durham Intervention	0.81	5.60	7.50	12.94	3.11	7.95	8.64	2.50	2.66	1.57	6.32	2.19	5.15
Durham Control	*-2.40*	*5.14*	*9.63*	*11.00*	*1.41*	*6.18*	*5.74*	*6.67*	*0.95*	*3.82*	*7.00*	*-2.00*	*4.43*
Leeds Intervention	10.00	-0.91	0.00	-8.00	-9.55	-1.82	-2.73	-5.91	-5.50	-5.00	11.00	-6.67	-2.09
Leeds Control	*9.17*	*-1.67*	*7.86*	*9.00*	*4.29*	*2.86*	*7.50*	*-2.50*	*-7.50*	*-5.00*	*10.00*	*-12.00*	*1.83*
UCLAN Efficient Both Info	15.00	-1.67	11.67	-5.00	-3.33	13.33	12.50	-12.50	0.00	-15.00	15.00	-15.00	1.25
UCLAN Efficient Hall Info	15.00	11.00	10.00	10.00	11.00	11.00	7.00	3.00	-5.00	-5.00	8.00	-3.33	6.06
UCLAN Efficient University Info	10.00	-5.00	15.00	15.00	15.00	10.00	10.00	-10.00	-5.00	10.00	10.00	5.00	6.67
UCLAN Efficient Control	*15.00*	*5.00*	*11.25*	*0.00*	*12.50*	*10.00*	*2.50*	*-7.50*	*-8.75*	*2.50*	*15.00*	*-10.00*	*3.96*
UCLAN Inefficient Both Info	15.00	2.50	9.17	15.00	10.83	6.67	2.50	-5.00	0.00	0.83	14.17	0.00	5.97
UCLAN Inefficient Hall Info	3.00	-4.17	9.17	0.00	1.67	0.00	-2.50	-7.50	0.00	-14.17	10.00	15.00	0.88
UCLAN Inefficient University Info	15.00	-13.33	3.33	15.00	-1.67	3.33	8.33	-10.00	-10.00	-10.00	15.00	-5.00	0.83
UCLAN Inefficient Control	*15.00*	*-5.00*	*10.00*	*15.00*	*13.33*	*5.00*	*11.67*	*-12.50*	*-15.00*	*6.67*	*15.00*	*-2.50*	*4.72*
UWE Ceiling	-2.73	-2.73	8.64	1.25	2.27	1.36	1.36	-11.82	-10.00	-9.09	-0.45	-5.00	-2.24
UWE Variable	7.50	5.00	10.00	0.00	12.50	2.50	0.00	2.50	-2.50	10.00	10.00	-10.00	3.96
UWE Control	*1.67*	*3.33*	*0.00*	*5.00*	*1.67*	*11.67*	*5.00*	*-10.00*	*-8.33*	*3.33*	*8.33*	*-1.67*	*1.67*

Figure 20. Baseline behaviours by intervention/control group at baseline.

For the following table, a habits are scored in the inverse, where a score of 7 indicates the strongest (i.e. least energy-efficient) habit; a score of 1 indicates the weakest (i.e. most energy-efficient) habit.

Baseline comparison	Leaving the heat on when I go out	Leaving the lights on in rooms which aren't being used	Filling the kettle with more water than I am going to use	Overall
Bradford Comparative	4.26	3.33	3.09	3.56
Bradford Competitive	3.27	2.72	2.89	2.96
Bradford Control	*3.85*	*2.82*	*3.63*	*3.43*
Durham Intervention	3.64	3.16	2.96	3.25
Durham Control	*3.80*	*2.60*	*2.86*	*3.08*
Leeds Intervention	2.81	3.84	4.56	3.74
Leeds Control	*2.70*	*3.14*	*2.73*	*2.86*
UCLAN Efficient Both Info	1.58	2.36	1.61	1.85
UCLAN Efficient Hall Info	2.28	2.65	2.32	2.42
UCLAN Efficient University Info	2.50	2.33	2.92	2.58
UCLAN Efficient Control	*1.47*	*3.06*	*3.25*	*2.59*
UCLAN Inefficient Both Info	1.00	3.24	4.26	2.83
UCLAN Inefficient Hall Info	3.07	3.29	4.77	3.71
UCLAN Inefficient University Info	1.27	1.81	1.42	1.50
UCLAN Inefficient Control	*1.93*	*2.22*	*2.36*	*2.17*
UWE Ceiling	3.96	3.83	3.61	3.80
UWE Variable	2.58	2.63	5.08	3.43
UWE Control	*4.36*	*4.53*	*4.44*	*4.44*

Figure 21. Baseline habits by intervention/control group.

Overall, the baseline tables (Figures 19 and 20) show much variation in the baseline positions of the different groups on both habits and behaviours. With regard to behaviours, the universities that appear to have students with the most positive environmental **behaviours** at baseline phase are Bradford, Durham and UCLan (efficient groups). The only university that appears to show particularly positive baseline student **habits** is UCLan (both efficient and inefficient hall groups). Throughout the rest of the analysis, assessment of the effectiveness of interventions will consider the baseline position of each group in order to assess the magnitude of any changes rather than the final position.

3.1.3 Second year control group: change outside the interventions

Before moving on to consider how the interventions influenced attitudes, behaviours and habits, it is useful to establish how students' energy use change as they move into their second year *without* having experienced any intervention to promote energy-saving habits.

Qualitatively, students' stated energy-efficient behaviours tend to increase during their second year at university when living in private accommodation, typically houses of multiple occupancy, where bills are rarely included. For instance, where students have to pay bills separately, many report taking measures to save energy and being aware of energy inefficient behaviours, such as leaving lights on.

"*When I came to university because it was all included I just went to town. But now I've moved into private accommodation I have to start being more mindful again…I've cut down so much*" Positive Green, Leeds, Follow-Up Focus Group (Control)

Again, this indicates that financial implications or incentives can motivate energy-efficient behaviour during students' second year in shared accommodation.

"*Because I'm paying my own I'm more aware of how much I am using and how much I should be using, and how much I'm wasting*" Positive Green, Leeds, Follow-Up Focus Group (Control)

"*But with regards to electricity and water wastage, this year my flatmate and I were very conscious of it so we don't do anything in excess…But last year it was a case of I've already paid for it so why should I bother*" Positive Green, Leeds, Follow-Up Focus Group (Control)

While various factors are known to influence energy behaviours (see section 2.1 Behaviour change interventions), it seems that paying separately for energy bills is a strong influence on students' behaviours and habits with regard to energy and the environment in the control groups – even amongst the most environmentally-conscious segments. The key issue is whether there is a difference in the habits and behaviours of students in the intervention and control groups, both during and following the intervention (measured by the follow-up surveys); this is explored in the following sections.

3.2 How did the interventions affect behaviours and habits?

In this section we detail the consistent findings from the focus groups and then the meter, survey, and specific focus group findings for each of the different interventions in turn.

3.2.1 Qualitative findings from the focus groups (all interventions)

Many of the findings from the focus groups had consistent themes amongst all the groups so are presented here first. Specific comments that only arose in one focus group or were specific to the intervention are given in following sections.

The main themes emerging from the focus groups were:

Environmental attitudes and awareness

- Mixed reactions towards environmental issues were displayed with some respondents implied that a stigma was attached to negative environmental behaviours.
- Others reported feelings of insignificance, and that environmental issues such as climate change are global issues and can't be dealt with at a local scale.

- Some students felt that they ought to save energy for altruistic reasons – to help the environment – even when there wasn't a financial incentive.

Infrastructure and technology

- External factors were perceived as preventing students from behaving in a more energy-efficient way at certain stages of their time at university, for example a lack of provision of technology such as washing machines capable of washing at low temperatures.

Being in control

- The influence of parents (and to a lesser extent schools) in inculcating energy efficiency behaviour and the change of moving away from them resulting in a change – generally to less energy efficiency behaviour but sometimes less.
- Some students felt more responsible having moved away from home; some, living in halls, didn't feel responsible.
- The feeling of lack of control over energy use in halls but more control (with some exceptions) when renting in 2nd year.

Financial (dis)incentives

- The lack of financial incentives to save energy when in hall, resulting in less efficient behaviour.
- When out of hall in the second year with energy bills to pay the return of financial incentive resulted in more efficient behaviour.

Peers and norms

- The strong role of peers in influencing behaviour – positively or negatively and the power of acting collaboratively.

University exemplification

- Concern that the university authorities don't either practice what they preach or do enough to encourage students to save energy.

Future behaviour

- Feeling that student lifestyle is not compatible with being green.
- Awareness that their energy behaviour will probably change in future in different circumstances.

These points are elaborated in more detail and illustrated with quotes from the focus groups below:

Environmental attitudes and awareness

Mixed reactions towards environmental issues were indicated from the baseline focus groups. Some respondents implied that a stigma was attached to negative environmental behaviours, whilst others reported feelings of insignificance, and that environmental issues -such as climate change - are global issues and can't be dealt with at a local scale. When asked about this in the follow-up focus groups, respondents indicated that climate change is an important issue, and it is valuable to learn about it; however, one respondent claimed action was more important than awareness.

> *"I don't think it's more that people aren't aware it exists, it's that people need to act on it."* Concerned Consumer, Durham, Follow-up Focus Group (Intervention)

"*It doesn't save us bills, but it does make you feel that little bit better about yourself*" Concerned Consumer, UCLan, Follow-Up Focus Group (Efficient halls and university information 2)

"*I feel I should really, a little voice in my head saying turn the light off*" Concerned Consumer, UWE Follow Up Focus Group (Intervention, Variable)

"*You just feel you should save the environment*" Concerned Consumer, UWE Follow-Up Focus Group (Intervention, Variable)

From baseline through to follow-up, students demonstrated a relatively strong understanding of wider environmental issues and many shared the same attitudes. Some students reported a greater awareness of environmental issues and were frustrated that this was not shared:

"I think I've got more aware of [environmental issues] because stuff that was said to me from the way I was brought up, like turning the lights off. Now I'm living with people from different backgrounds that have been brought up differently. Now I'm more aware and it's irritating. You see people not do simple things that can save energy." Waste Watcher, Bradford, Follow-Up Focus Group (Comparative)

Others thought that student attitudes and perceptions are often under-estimated. When asked to what extent students care about the environment, one student said:

"I think you'd be surprised, with the student thing going on at the moment, you wouldn't believe how many people care [Edited], but a lot do [referring to the protest against rises in student fees]. *I think it would be the same sort of thing with the environment"* Cautious Participant, UWE, Follow-Up Focus Group (Intervention, Variable)

Some students highlighted that the intervention had raised awareness regarding environmental issues, but it did not encourage action. **Helplessness** and a lack of generational responsibility were noted:

"I think in a way [acting on climate change] is kind of impossible with the number of people in the planet" Sideline Supporter, UWE, Baseline Focus Group

"I don't really care; I'll be dead when it gets bad. The generation before us messed it up and they don't seem to care" Sideline Supporter, UWE, Baseline Focus Group

"Everyone is conscious of it, but no one goes out and does anything" Concerned Consumer, UWE, Follow-Up Focus Group (Intervention, Ceiling)

Infrastructure and technology

Additionally, **external factors** were perceived as preventing students from behaving in a more energy-efficient way at certain stages of their time at university. For instance, low temperature settings on washing machines were often reported as being non-existent or confusing; some students had nowhere to dry clothes; many felt a lack of

control over their heating; and some cited a concurrent police awareness campaign that recommended students leave lights on to discourage burglars in halls of residence.

> "*You can't turn them [heaters] up or down, it's on or off!*" Positive Green, Durham Post-intervention Focus Group (Intervention)

> "*It's a lot easier at home when you have more control*" Stalled Starter, UCLan Baseline Focus Group

> "*…last year we didn't have a washing line so we had to tumble dry*" UWE Follow-Up Focus Group (Intervention, Variable)

> *"I think the majority of students do care, but it's how easy it is to recycle. If there were a load of recycling stations then you would, but now you have to go all the way to a tip to recycle."* Concerned Consumer, Leeds, Follow-Up Focus Group (Intervention)

Being in control

As noted in section 3.1.1, (baseline attitudes) a key factor affecting whether students engaged in energy-efficient habits and behaviours at all the universities was qualitatively reported as **parental insistence**.

> "I *think it's more awareness, I think you just do things, your mum is always like 'turn the light off' and you just do it. So you come to uni and just do it*" Concerned Consumer, UCLan, Follow-Up Focus Group (Efficient Halls and University information 1)

> "*I think it's from my family, we always used to use low energy light bulbs, because we know that it really saves energy, it's cheaper and lasts for years. My parents have always told me to save energy*" Bradford, Baseline in-depth interview (Nov 2009).

> "*I do [act in an environmentally friendly way], because my mum and dad have always been really picky about it, turning off lights. It's become habit. I guess it's how you've been brought up*" Concerned Consumer, UWE Follow-Up Focus Group (Intervention, Variable)

Once parental influence was removed, students generally behaved in a less energy-efficient way.

> "*I'm turning less lights off…Cos I've got no-one shouting at me!*" Concerned Consumer, UWE Post-Intervention Focus Group (Intervention)

> *"I always unplug it [laptop] from the socket. The lights, the only reason I let it be at Leodis is that everything is paid for. At home, every room I leave I turn the light off, that is out of habit"* Positive Green, Leeds, Follow-Up Focus Group (Control)

> "*At home I turn my laptop off, here I don't. I've got worse. I used to turn the lights off at home and now I don't. I'm less eco-friendly now*" Honestly Disengaged, UCLan Baseline Focus Group

In the second year, students reported a greater sense of control and responsibility associated with running their own house.

> "*I think it's completely different. We were on campus, everything was there and everyone was there. We were in a bubble. But now we're living out it's like being a real person, we have bills and responsibilities, I like it*" Concerned Consumer, UWE Follow-Up Focus Group (Intervention, Variable)

> *"[In halls] the heating would only be turned on at certain times of the year, you didn't have the choice, but now we do"* Honestly Disengaged, Durham, Post-intervention Focus Group (Intervention)

Financial (dis)incentives

In terms of motivating factors, money was seen as a greater influence on behaving in an energy-efficient way than the environment.

> "*The first thing I think about is the money not the environment*" Stalled Starter, UCLan Follow-Up Focus Group (Efficient Halls and University information 2)

> "*I probably will next year when I move into different accommodation when electricity is paid separately because…I need the money to get through University for books and everything so I don't want to be wasting it on leaving lights on or whatever*" Honestly Disengaged, UCLan, in depth interview (Baseline survey)

> "*Whenever we get all the posters saying we've been worse than other flats for energy consumption, it annoys me because if I want to have the light on at night, to get a drink or something, I should because I've paid for it*" Honestly disengaged, Bradford, Post-Intervention Focus Group (Competitive)

This also applies to other environmental habits with the respondents typically implying that any positive environmental behaviours would be financially driven:

> *"When it benefits them, if there is a monetary reward then they will save"* Concerned Consumer, UCLan, Follow-Up Focus Group (Control)

Whilst living in halls of residence, both the intervention and control groups demonstrated a large decrease in energy-efficient habits and behaviours during their first year at university, possibly due to the lack of **financial implications** for energy use. This is also noticeable within the qualitative results:

> "*I'll think about it when I have to pay for it*" Waste Watcher, Durham, Baseline Focus Group

> "*All my bills are included, so I haven't got any motivation to change anything*" Cautious Participant, Durham, Post-intervention Focus Group (Intervention)
> *"I think this year I've taken advantage of the fact energy is included, next year I'll be more cautious"* Positive Green, Leeds, Baseline Focus Group

"I use more energy now...I haven't got the responsibility of paying the bills" Honestly disengaged, Leeds, Baseline Focus Group

"*It is all centred around money though. We're not saying any of this because we want to help the environment*" Positive Green, Leeds, Follow-Up Focus Group (Intervention)

"*It's not really worth trying to influence anybody because we're all paying a fixed rate anyway and it's all individual, so if somebody saves energy it's not saving me anything*" Honestly Disengaged, UCLan, Follow-Up Focus Group (Efficient Halls and University 1)

"I think when you've already paid for it, even though you have a bit of control you're just not bothered" Honestly Disengaged, UCLan, Follow-Up Focus Group (Control)

Whilst living in halls, some participants felt that they should use a lot of energy as they had already been charged a high fee.

"*…they might be overcharging us [in halls] just in case we use it quite a lot which kind of makes me want to use it a lot*" Concerned Consumer, UCLan in-depth interview (Baseline survey)

"*… I use more energy than I should, because I'm trying to get as much as possible out of it*" Honestly Disengaged, UWE Baseline Focus Group

As highlighted above, the move into privately rented accommodation in their second year was predicted as a driver for change in behaviour for some respondents, reflecting a change in control and but also in financial incentive. For instance, students reported caring about energy saving in their second year when they paid their own bills.

"When I live at home, my dad is so paranoid about the lights and electricity. If you leave the light on he'll shout, at home I have to be mindful of it. When I came to university because it was all included I just went to town. But now I've moved into private accommodation I have to start being more mindful again, I don't leave my laptop on, straighteners, hairdryers, phone chargers. I've cut down so much. I suppose it's a good thing" Positive Green, Leeds, Post-Intervention Focus Group (Control)

"*For me, now I've moved to the house I care more about bills. I have to pay for the electricity. I find myself telling my housemates that they should watch water, close the taps and things like that*" Concerned Consumer, Bradford, Follow-Up Focus Group (Comparative)

"*We hardly ever have the heating on even when it's freezing, because we pay for it*" Positive Green, Durham, Follow-Up Focus Group (Intervention)

"*Our main concern is the financial aspect. I don't think anyone has ever said 'oh don't have that on because of the environment'*" Positive Green, Durham, Follow-Up Focus Group (Intervention)

"*… I did more before last year, and now I do much more than last year. Probably more now than ever*" Concerned Consumer, UWE Follow-Up Focus Group (Intervention, Variable)

"It's changed since I've moved into a house but I think that's more to do with money. I do turn lights off and switch things off at the plug, and I didn't do that in college. I think it's just money" Sideline Supporter, Durham, Post-Intervention Focus Group (Control).

However, others had become more energy-efficient since starting university, demonstrating that the shift in student behaviour, at this particular moment of change, can be either positive or negative, depending on a range of factors.

"*I started switching lights off here more than at home*" Honestly Disengaged, UCLan Baseline Focus Group

"Some people recycle now, I didn't recycle before I came to university, now I separate everything" Stalled Starter, UCLan, Post-Intervention Focus Group (Intervention)

"*I guess living with people that we know you're kind of similar anyway, and you're more inclined to do it if everyone says can we recycle or try to turn lights off*" Concerned Consumer, UCLan Follow-Up Focus Group (Efficient halls and university information 2)

Peers and norms

Housemates were also a major influencing factor and students whose housemates did not save energy (or recycle) often behaved similarly, believing their housemates' actions would cancel out any environmentally-friendly behaviours they engaged in.

"*If you tell someone to turn things off in our house they'll just say that they've paid for it so they're going to use it*" Concerned Consumer, Durham, Follow-Up Focus Group (Intervention)

"I'll do it but if nobody else does it then I'm not doing anything. One small person can't do a lot." Stalled Starter, UCLan, Baseline Focus Group

"[My environmental behaviour] *dipped a little bit, because I live with new people and they don't recycle. We don't do it half as much as we did last year*" Concerned Consumer, UCLan, Follow-Up Focus Group (Efficient Halls and University information 1)

"*I think the people in your flat as well. After a while they are going to influence you. If they do certain behaviours then you're probably going to end up doing it too*" Positive Green, Bradford Baseline Focus Group

"*In my flat people aren't bothered, they don't care about saving energy*" Positive Green, UWE Post-intervention Focus Group (Intervention, Variable)

Some students reported problems in getting all of their flatmates to take part, which discouraged them from changing their behaviours, due to a belief that a few people's actions would negate others' efforts to reduce energy use. This is indicative of a need for a sense of control and group efficacy:

"*We thought no one else in our flat will do it so it wouldn't make a difference*" Concerned Consumer, UWE Follow-Up Focus Group (Intervention, Variable)

"*When you try to save energy and one person doesn't try anything at all it's really frustrating*" Honestly Disengaged, UWE Baseline Focus Group

On the other hand some students engaged in many energy-efficient behaviours whilst living in shared accommodation and saw several benefits to such behaviours, including coming together as a group to do other things, again fitting into a model of **control** – collaboration is essential in developing group behaviours and a sense of collective efficacy.

"*…it does influence you what the others are doing in the house. My flatmates last year did nothing, but this year we all do it, so it's good*" UWE Follow-Up Focus Group (Intervention, Ceiling)

"*It creates a group feeling because you're all doing it together*" Concerned Consumer, UCLan Post-intervention Focus Group (Intervention)

"*My flat kind of just made a group effort, one of us would say something and we'd all do it*" Honestly Disengaged, UCLan, Follow-Up Focus Group (Efficient Halls and university information 2)

Regarding influencing housemates/flatmates, attitudes towards encouragement of positive environmental behaviours appear to have shifted. At baseline some respondents said that they would encourage more positive environmental behaviours; however, by the second year it was seen as patronising, and that it is the choice of the individual to do it or not.

"I think they know how to do it, it's up to them." Concerned Consumer, Durham, Post-intervention Focus Group (Intervention)

One issue that was only explicitly stated by one student, but is implicit throughout all the focus groups, is the idea that being energy-efficient does not fit with the **student lifestyle**.

"*I think it's the student lifestyle in general, you don't feel fantastic, you don't want to spend ten minutes sorting out your rubbish*" Honestly Disengaged, Durham, Follow-Up Focus Group (Intervention)

"I think lots of students don't care about it, because they enjoy the uni life, they just want to go out and leave the lights on" Concerned Consumer, Leeds, Follow-Up Focus Group (Control)

University exemplification

Some students felt there was a disconnect between the behaviour of the university, which they perceived as relatively un-environmentally friendly, and the fact they were being asked to behave in an energy-efficient way personally.

"*Nothing seems to be in place already [at the university]; they don't even use energy saving light bulbs. If you turned up and there were lots of things that are already energy saving behaviours you'd do it*" Positive Green, Leeds, Post-Intervention Focus Group (Intervention)

"I love the fact the university goes on about energy saving, but in the lecture theatre I go to in Houghton, you can actually see a gap between the wall and the window frame, and it's actually freezing in there, so they turn the heating up more. It's all going outside and wasting energy!" Waste Watcher, Bradford, Follow-Up Focus Group (Comparative)

Future behaviour

Perceptions of future behaviour varied, with some students believing they would behave in a more energy-efficient way when they were a professional with a house and a family and others stating that they would care less about saving energy in the future when they had fewer financial concerns.

"*I'd like to think when I'm a professional with a house and family I'll get into the habit of doing these things*" Honestly Disengaged, Durham, Follow-Up Focus Group (Intervention)

"*It's a good habit to get into and stuff. I know when I have kids I'm going to be getting them to do it*" Cautious Participant, UCLan Follow-Up Focus Group (Efficient halls and university information 2)

"*I think once I'm earning more money I'd have a warmer house, I wouldn't worry about turning things off*" Sideline Supporter, Durham, Follow-Up Focus Group (Habit persistence case study)

3.2.2 General Awareness (Information) campaign (Durham)

Intervention summary
A general awareness campaign was run at Durham, involving four residential blocks separately metered for electricity and gas use. The intervention ran from January to June 2010. The control group of two blocks received no energy saving awareness communications within this time, whereas the intervention group of two blocks received a series of energy-efficiency communications. These communications included: stickers on all flat light switches; fortnightly posters in kitchens; frequently updated energy efficiency notice boards; and a leaflet drop. Meter data was monitored weekly to assess changes in energy consumption within the control and intervention groups. Baseline and follow-up surveys and focus groups also explore change in attitudes and behaviours.

Baseline differences
Examining the initial habits and behaviours of the control and intervention groups illuminates the similarities and differences in energy-efficient habits and behaviours between the two groups prior to the intervention being conducted. Appendices 8 and 9 dissect this data in detail, but overall there are only slight baseline differences between the Durham control and intervention groups.

Meter data results
Results from the meter data are positive for the intervention at Durham. The control group consistently used more energy per head than the intervention group before the intervention and this difference increased after the intervention started. This suggests that the intervention did make a difference (see Figure 22). Furthermore, the intervention group had relatively even consumption, whereas during and after the intervention the control group showed more pronounced peaks and troughs.

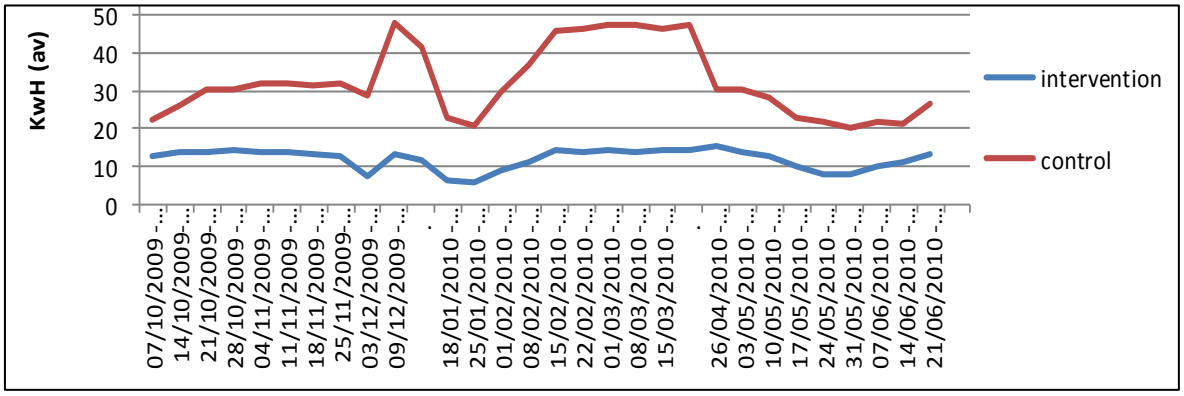

Figure 22. Energy data per head: Intervention versus Control: University of Durham

Survey results

Although both the intervention and control groups displayed positive environmental behaviours in the baseline phase of the study, by the post-intervention survey both groups had decreased and remained below baseline by the follow-up (year two).

With regard to the three habits the results are shown in Figure 23. The changes and sample sizes are small so it is not possible to draw robust conclusions from these data.

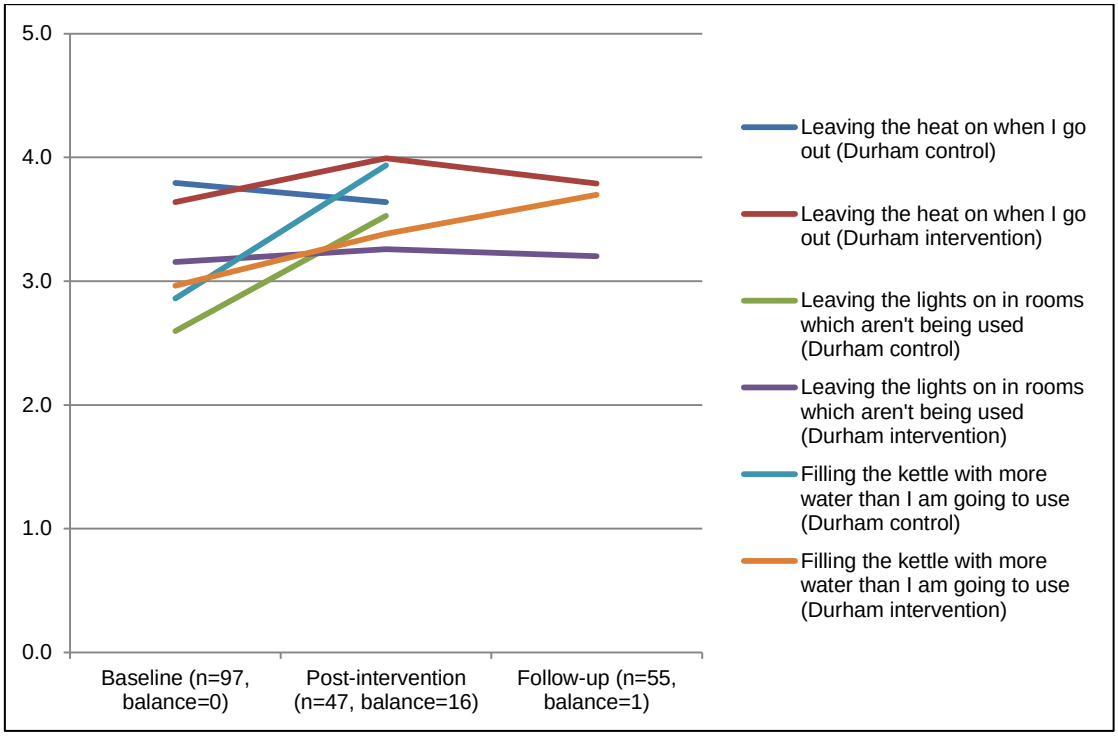

Figure 23. Change in energy habits across the intervention and follow-up period (Durham)

In contrast to the energy metering results the quantitative survey data do not suggest a positive result from the intervention.

Qualitative results

The general attitudes and concerns of students from the focus groups are covered in section 3.2.1 Qualitative findings from the focus groups (all interventions).

In terms of the intervention, the focus group response was that the posters were viewed by many as '**reminders'**, with most students stating that they were already aware of all the information the posters gave and that motivation was what was needed rather than knowledge.

> "*It's not a question of knowledge, we all know how to save energy it's just motivation [that is needed]*" Honestly Disengaged, Durham, Follow-Up, Focus Group (Intervention)

One student identified the posters as a positive factor for increasing awareness about the environment.

> *"I've become more aware of it, because of all the posters everywhere"* Honestly Disengaged, Durham, Post-Intervention Focus Group (Control)

However, at best, the intervention was seen as producing very **short-term** changes in behaviour or prompting students to think about their behaviour.

> "*It only ever has a short-term influence, you turn off the lights for the next two days*" Stalled Starter, Durham, Follow-Up Focus Group (Intervention)

Many students viewed the posters **negatively**, stating that there were too many and that they were repetitive and dull. Students also believed that the posters would have been more effective if they were placed elsewhere, such as next to all the appliances to which they referred.

> "*You don't want to feel like you're being lectured by someone. Make sure you do this and this, it feels a bit patronising*" Honestly Disengaged, Durham, Follow-Up Focus Group (Intervention)

Additionally some felt that the information on the posters was irrelevant, such as encouraging them to turn their heating down when they had no control over this, or just common sense.

> "*I think sometimes the ones for environment can be a bit misdirected, they mention a lot of things that we don't have control over*" Concerned Consumer, Durham, Post-intervention Focus Group

As is common in action research projects, some students cited coming to the focus groups as a positive influence on their behaviour, in addition to or rather than the intervention.

> "*I think if more people came to sessions like this [the focus group] then they would do more*" Concerned Consumer, Durham Follow-Up Focus Group (Intervention)

The lack of financial incentives for undertaking the behaviours led many to ignore the posters, but some students suggested that if the posters had made a link between learning these behaviours while in halls and saving money when living in shared accommodation, they may have had more impact.

> "*Statistics about how much money you can save makes you realise what you can do*" Honestly Disengaged, Durham, Follow-Up Focus Group (Case study)
>
> *"Maybe if they said something like if you practise it now it would become a habit by second year and it'll save you money"* Honestly Disengaged, Durham, Post-Intervention Focus Group (Intervention)

Overall, the intervention was seen as useful for students who had not been brought up to behave in an energy-efficient way, but was not perceived as useful by those who had.

> "*If you care already, you'll take notice. If you don't care, then there is not much you can do*" Concerned Consumer, Durham, Baseline Focus Group

3.2.3 Peer-to-Peer encouragement (Leeds)

Intervention summary
The Leeds intervention involved ten flats at a privately-owned hall of residence. Five flats acted as controls and received no intervention, while the other five received encouragement from a number of student reps who were recruited from within the residences and trained in how to encourage others to adopt energy saving behaviours. We refer to this as peer-to-peer encouragement. Meter, survey and focus group data were

Baseline differences

Analysis of the baseline data (see Appendices 8 and 9 for further details) shows large baseline differences between the Leeds Control and Intervention groups, with participants from Leeds Control giving more energy-efficient responses with regard to all three habits and six of the twelve behaviours (bearing in mind that the three habits were also covered in the twelve behaviours).

Meter data results

Results from the meter data are ambiguous. While the control group had higher electricity consumption per head than the intervention group (despite the control group indicating that they exhibited more pro-environmental behaviours than the intervention group prior to delivery of the intervention). This applied throughout the whole metered period (Figure 24) including the first term where there was no intervention. That is, there is no clear indication that the intervention affected the energy use of the intervention group. Overall, the control group showed higher peaks and troughs in electricity consumption than the intervention group, indicating a less even pattern of use – but this also was true before and after the intervention.

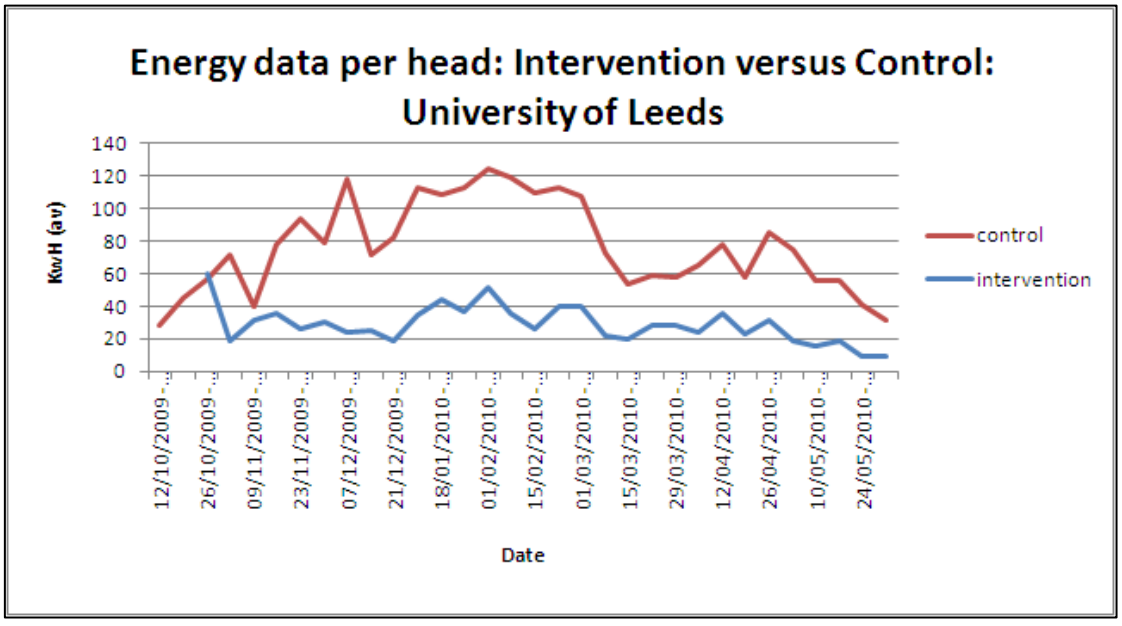

Figure 24. Energy data per head: Intervention versus Control: University of Leeds

Survey results

Both Leeds intervention and control showed an increase in energy-efficient behaviours between the baseline and follow-up surveys. Students within the intervention appear to show a larger increase in energy-efficient behaviours than the control, suggesting that the intervention had a positive effect on students' behaviours above that which would have been expected otherwise (i.e. had there been no intervention;). With regard to the three habits (Figure 25), students in the Leeds intervention group showed a slight positive change in energy-efficient habits between the baseline and post-intervention surveys, which was largely sustained through to follow-up; whereas those in the control group showed a slight negative change. This suggests that the Leeds peer-to-peer intervention appears to have had a positive effect on students' behaviour (bearing in mind that all three habits are also included in the twelve behaviours).

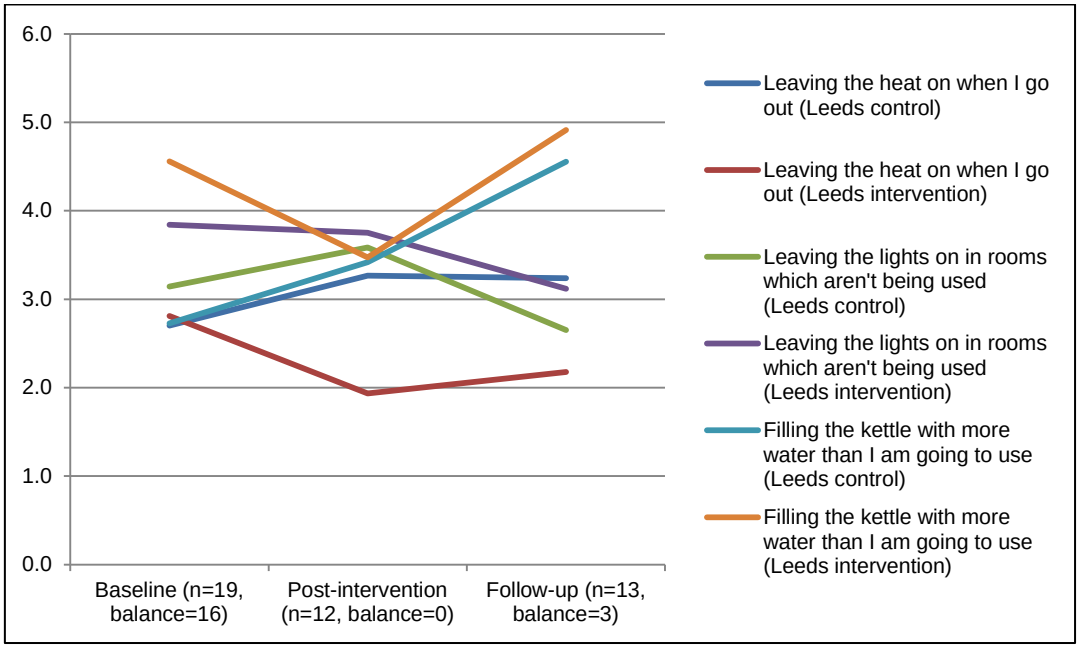

Figure 25. Change in energy habits across the intervention and follow-up period (Leeds)

The Leeds intervention appeared particularly effective at increasing the number of students who conducted several energy-efficient behaviours during their time in halls (indicated in the post-intervention survey), whereas the control initially showed a sharp decrease before converging with the intervention group levels in year 2 (see Figure 26). Therefore, those participants in the intervention group did not display the "dip" in energy-efficient habits and behaviours expected of students during their first year at university.

The lack of durable effect over and above external changes (i.e., the move to private accommodation) however, could suggest that peer-to-peer encouragement does not have a lasting impact beyond the context in which it is enacted. Alternatively it could be that the financial incentive to save energy in the second year was the reason that the

behaviour of the two groups converged. The low sample size for this data means that the results are only suggestive.

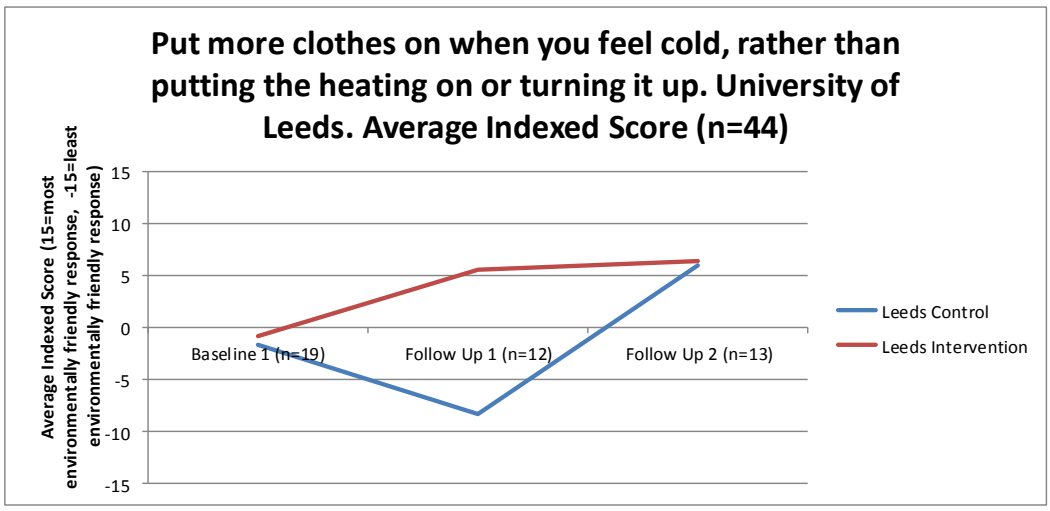

Figure 26. Year-on-Year Changes: "Put more clothes on when you feel cold, rather than putting the heating on or turning it up", University of Leeds (Control n=16, Intervention, n=28)

Qualitative results

The focus groups give further insight into the success of the intervention and raise several issues for future behaviour change projects. For instance, although many students had a positive experience with their reps, others stated that they found them off-putting.

> "*No [I haven't read the posters], but I've seen her [the peer-to-peer rep], she's really weird, she just looks at our board and sticks it on*" Positive Green, Leeds, Post-intervention Focus Group (Intervention)

The general consensus was that more explanation and more **interaction** were needed, rather than reps putting up posters without explaining what they were doing or why.

> "*But they didn't say anything, I didn't even know it was something I could get involved in*" Honestly Disengaged, Leeds, Follow-Up Focus Group (Intervention)
>
> "*Then you'd probably need more people to actually explain it, rather than just leave a poster on a table and walk out*" Honestly Disengaged, Leeds, Follow-Up Focus Group (Intervention)

Respondents suggested that the approach that their reps had taken could have been more varied. The suggestions included having reps that were more personable, funny and interactive. One student disagreed with the idea of having a rep intruding, and indicated how they would feel if they were a rep:

> *"In my flat, I can be more bossy, but in the other flats I don't feel I can. They don't really care"* Positive Green, Leeds, Post-Intervention Focus Group (Intervention)

In contrast to the meter and survey data, most students believed that the intervention had *not* caused them to change their habits or behaviours and many stated that they

already knew how to save energy prior to the intervention. This is indicative of the difficulties in studying behaviours – individuals rarely believe that they have been influenced, and are more likely to state that they have chosen themselves to act in a particular way (e.g., Nolan *et al*, 2008). Additionally, and consistent with the Durham intervention, focus group respondents in Leeds did not tend to feel they had learnt anything *new* from the intervention:

> "*I don't know if it was so much the scheme, because we already knew how to save energy, we didn't learn that from the scheme*" Honestly Disengaged, Leeds, Follow-Up Focus Group (Intervention)

Respondents indicated that the intervention served to **reinforce** what they already knew, and again, financial savings were emphasised.

However, a minority of students found the posters and stickers helpful, and preference lay towards situational prompts:

> *"The posters were pretty good, they were bright and noticeable"* Positive Green, Leeds, Follow-Up Focus Group (Intervention)
>
> "*The little sticker on things which say turn me off, that makes me do it*" Positive Green, Leeds, Post-intervention Focus Group (Intervention)

Other students criticised the posters by suggesting that they weren't eye-catching, and that there should have been more memorable catchphrases. The **location** of the posters was also mentioned, students indicated that they would be more inclined to read them if they were in communal areas, or included in the information packs which they received in their first week.

Although many of the qualitative comments surrounding the intervention were either ambivalent or negative, the quantitative data suggests that students within the intervention group conducted more energy-efficient habits and behaviours during their time in halls than the control group (although this is not supported by the energy meter data which did not show a response from the intervention). There is, therefore, some evidence of a potential value-action gap (Kollmuss & Agyeman, 2002), which may be explained by the following factors for further research:

1) Respondents were all in their first year of university and the demographic was typically between 18 and 20 years old. Most had not met each other before the baseline focus groups, and most reported that they had not participated in qualitative focus groups prior to the baseline focus groups themselves; therefore social desirability bias could have affected the focus groups;
2) Students may have been reluctant to accept that the posters had affected their behaviour, preferring to attribute changes in behaviour to themselves or other influences.

3.2.4 Energy-efficient university/halls (UCLan)

Intervention summary
An informational intervention was carried out within sixteen flats at UCLan: eight flats within a relatively new block with very high environmental standards (Efficient halls) and eight flats within a 1970s block that has much lower environmental standards (Inefficient halls).

- Students in two flats in each block received no information about how green the university and the halls are (Controls);
- Students in two flats in each block received regular flyers about how green the university is (Efficient/Inefficient Hall - University Information);
- Students in two flats in each block received regular flyers about how green the halls they are living in are (Efficient/Inefficient Hall – Hall information);
- Students in two flats in each block received regular flyers about both how green the university is and how green the halls they are living in are (Efficient/Inefficient Hall – Hall

Please refer to section 2.1.3 Efficient university and halls – UCLan for information on the naming of each intervention at UCLan.

Baseline differences

The baseline analysis (see Appendices 8 and 9) shows a wide range of scores for behaviours and a smaller range of scores for habits. Overall, prior to the intervention the four groups living in the efficient Hall showed large differences in energy-efficient behaviours and slight differences in habits. Differences also existed within the UCLan sub-groups living in the inefficient Hall, with UCLan Inefficient hall Control and UCLan Efficient Hall - hall & university information groups having the most energy-efficient scores across the twelve behaviours, and UCLan Efficient Hall - University information having the most energy-efficient scores across the three habits.

Overview of meter data results

Figure 27 shows the average consumption of energy per head across the two types of halls for each group (all interventions and control) taking part in the study. On the whole, the average consumption is lower within the efficient hall compared to the inefficient hall. Overall, the interventions and control groups as a whole showed very similar energy consumption across the metered periods (figures 28 and 29). What is more the ratio of the different groups is largely the same before and after the intervention which suggests a limited impact of the intervention on energy use.

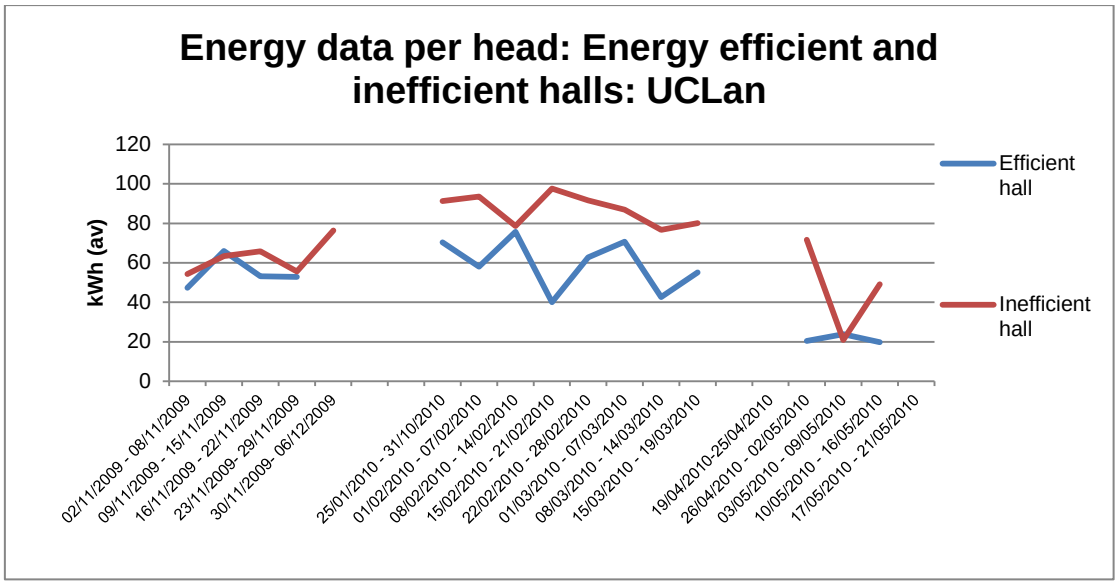

Figure 27. Energy data per head: Energy efficient and inefficient halls: UCLan

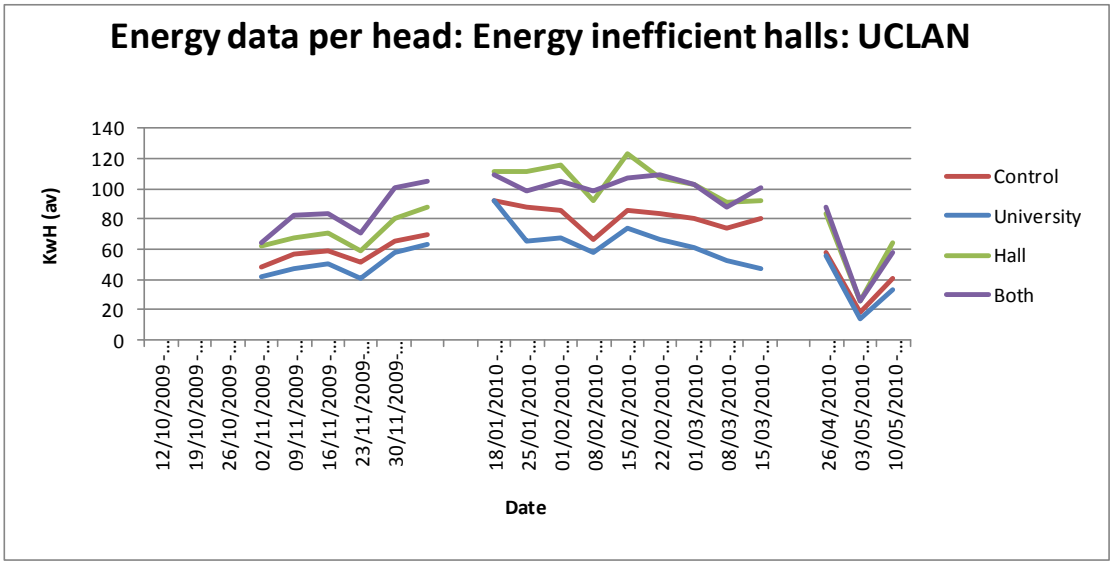

Figure 28. Energy data per head: Energy inefficient halls: UCLan

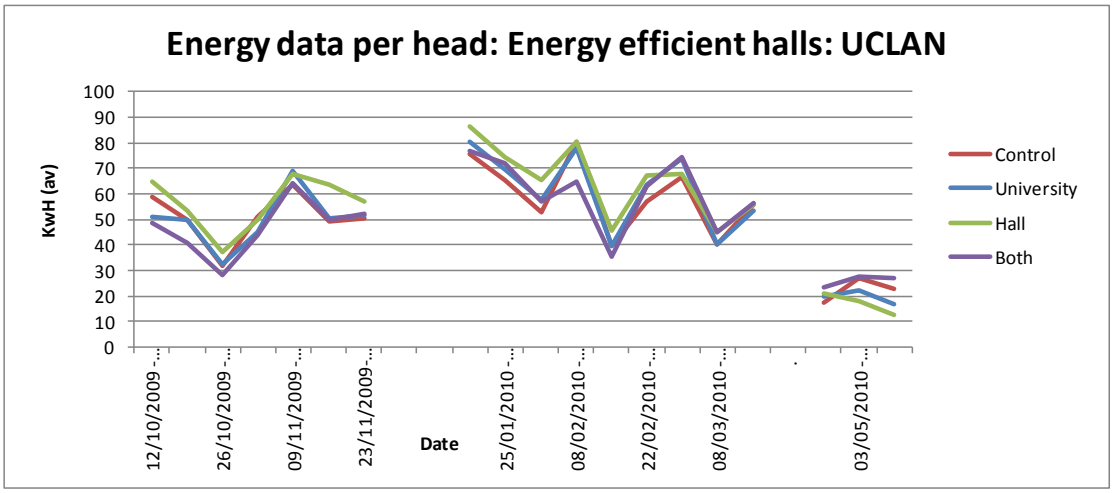

Figure 299. Energy data per head: Energy-efficient halls: UCLan

Survey results

Although the baseline behaviours shown by the eight UCLan groups varied greatly, all were environmentally positive. Again, despite some variation in scores, all eight UCLan groups displayed reasonably energy-efficient habits at baseline. However, with regard to changes within the timeframe of the study, all interventions showed an increase in energy-inefficient habits between baseline and post-intervention (Figure 30); these were sustained to follow-up with the exception of the combined group whose habits became more energy-efficient by year 2.

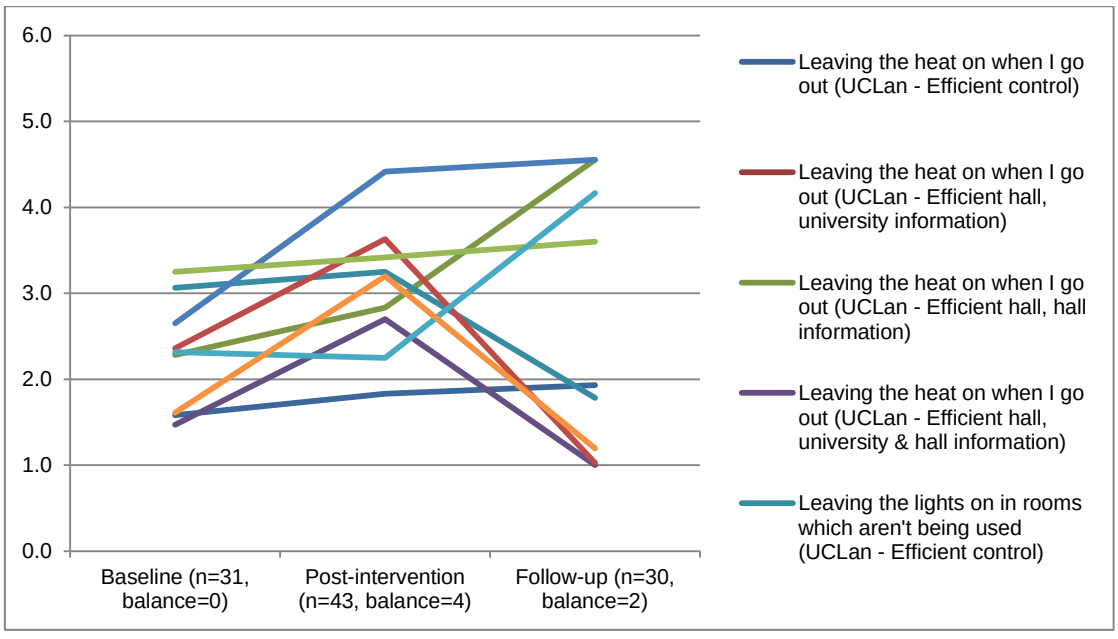

Figure 3030. Change in energy habits across the intervention and follow-up period (UCLan)

For several behaviours (such as leaving lights on in empty rooms, leaving mobile phone chargers switched on when not in use and putting lids on pans; see Figures 30 and 31), results from UCLan were contrary to expectations, but in line with other recent research

findings about the rebound and licensing effects – in other words that energy savings through efficiency measures are partly offset by increased energy use or that people feel entitled to use more energy if efficiency measures are in place (see section 2.1.3 Efficient university and halls – UCLan). However, due to the number of interventions carried out at UCLan the sample sizes for individual groups were small, meaning a repeat study with a larger sample size is necessary to validate these initial findings. Additionally, the results from the intervention groups did not always differ markedly from the control groups, potentially indicating that the influencing factor in this case could be the accommodation rather than the intervention.

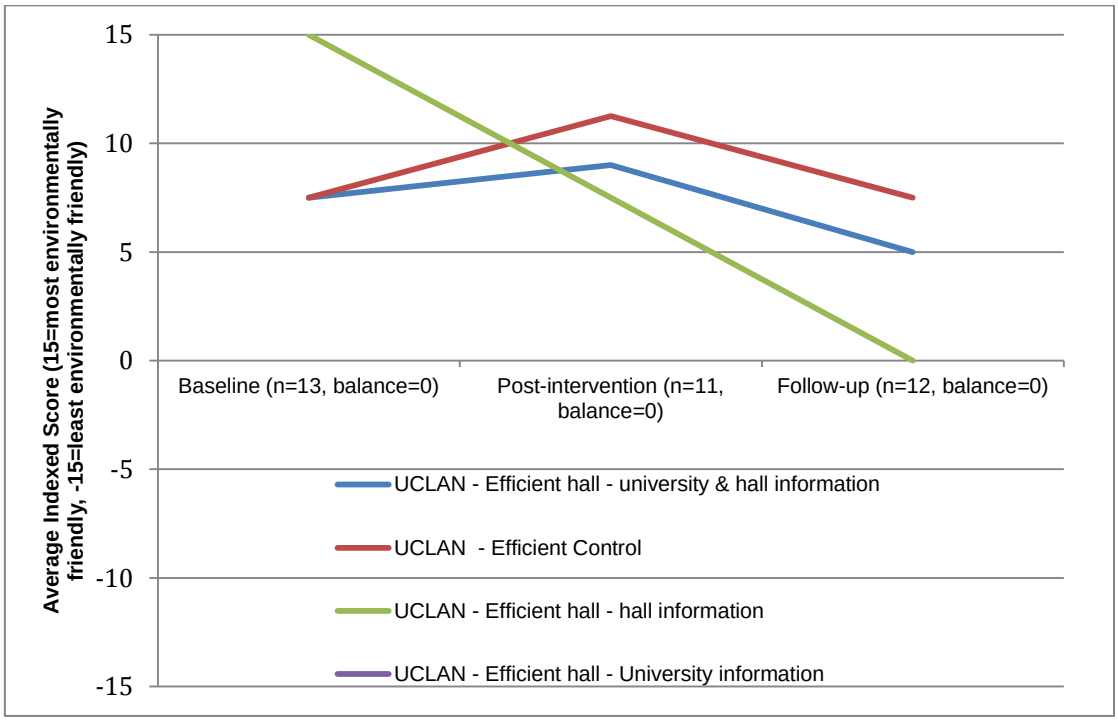

Figure 311. Year-on-Year Changes: "Leave lights on when no one is in the room", University of Central Lancashire, Interventions in efficient halls (n=36)

Qualitative results

The general attitudes and concerns of students from the focus groups are covered in section 3.2.1 (Qualitative findings from the focus groups (all interventions)).

In terms of the intervention, the focus groups findings were that the use of posters was generally **disliked** by students. In particular, students complained that the same poster was delivered numerous times, wasting paper and irritating occupants.

> "*We were getting exactly the same [poster each time]*" UCLan, Follow-Up Focus Group (Efficient Halls information 1)

Using the same layout to create brand recognition had some negative results, as students discarded new posters when they saw the same layout.

"*I didn't read every single one, if they came with the same layout I'd just not read it again because it looks like the others*" UCLan, Follow-Up Focus Group (Efficient Halls information 1)

The general consensus was that the posters were telling students to do things that they already did, so although the posters prompted about the need to change behaviours, these were generally not new concepts for the majority of students.

"*I was already aware of saving energy and how to do it. I don't think there was anything else on it, it would have to be a big list of things you could do*" Concerned Consumer, UCLan Follow-Up Focus Group (Efficient University information 1)

Additionally, many students identified that the posters had made them **think** about their behaviours, but had not changed their behaviours.

"*I remember seeing it, and thinking 'that's a good idea', but not doing anything*" Concerned Consumer, UCLan Follow-Up Focus Group (Efficient University information 1)

Other students criticised the content of the posters, in particular for amount of information given, or the lack of incentive for behaviour change.

"*I think there could have been more information on how to save energy. And more reward, whichever flat saves the most energy this week gets cinema tickets or something*" Concerned Consumer, UCLan, Follow-Up Focus Group (Efficient university information 1)

One common issue was students believing they were **unable** to conduct certain behaviours, including some behaviours that the posters encouraged them to conduct.

"*I read it, but I didn't act on it. Because the one that we kept getting was an A4 leaflet about bulbs, and we were like we can't even change the bulbs*" Concerned Consumer, UCLan Follow-Up Focus Group (Efficient university information 1)

"*The washing machines last year just had one setting*" Concerned Consumer, UCLan Follow-Up Focus Group (Efficient university information 1)

However, feasibility studies had been conducted at halls of residence to ensure all the behaviours were possible, so this potentially indicates the need for more local information regarding the energy saving behaviours that students can conduct.

Students suggested an array of delivery methods for increasing energy-efficient behaviours. Advice on what to do, rather than being told what not to do was echoed by a number of respondents. Alternative methods to flyers were also mentioned. Plasma screen advertising and the use of Webmail and Facebook were popular alternatives. Some students indicated that shock tactics would be effective means of changing behaviours:

"Give a flash-forward of what could happen if you don't start [acting] now." Honestly Disengaged, UCLan, Baseline Focus Group

Additionally, the necessity of a mentor or face-to-face introduction alongside the posters was noted by some students as a way to engender positive behaviour change.

> "*You'd pay more attention if there was a mentor in each flat*" Concerned Consumer, UCLan, Follow-Up Focus Group (Efficient halls information 1)
>
> "*She came and personally delivered it which made me read it because she put it in my hand. If it were in the letterbox downstairs I probably would have just put it in the bin*" Concerned Consumer, UCLan, Follow-Up Focus Group (Efficient university information 1)

3.2.5 Comparative and competitive (Bradford)

Intervention summary
Competitive and comparative interventions were carried out across 22 separately metered flats at Bradford.

- Students on two floors received no information about their energy usage (Controls);
- Students on two floors received weekly updates of their energy consumption compared to the previous week (Comparative intervention);
- Students on two floors received weekly updates of their energy consumption compared to the previous week plus comparative information about the energy consumption of the other floor (Competitive intervention).

Again, meter, survey and focus group data assessed the impact of the interventions.

Baseline differences

Baseline analysis (see Appendices 8 and 9) shows that overall there were only small baseline differences between the Bradford intervention and control groups. Bradford Competitive showed the most energy-efficient responses for both habits and behaviours, and Bradford Comparative showed the least energy-efficient responses; Bradford control ranked in the middle.

Meter data results

NB only electricity was metered and not used for heating so the metered energy use data does not include heating. This is in contrast to the energy behaviour and habits covered in the quantitative survey which include heating related behaviours.

Overall, in almost all periods, the intervention group had higher energy consumption than the control group (Figure 32) and there was no appreciable change in the ratio of the two after intervention. This also applies when split into the individual interventions (Figure 33). This suggests that the intervention had no effect on energy usage.

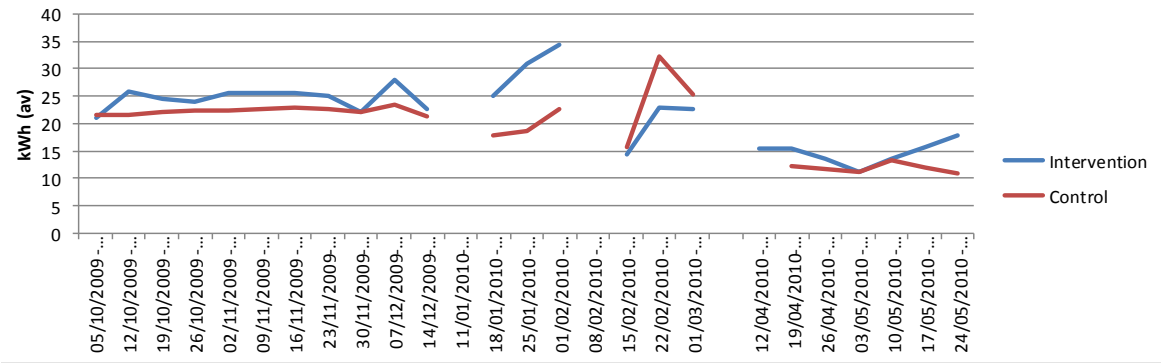

Figure 32. Energy data per head: Intervention versus Control: University of Bradford

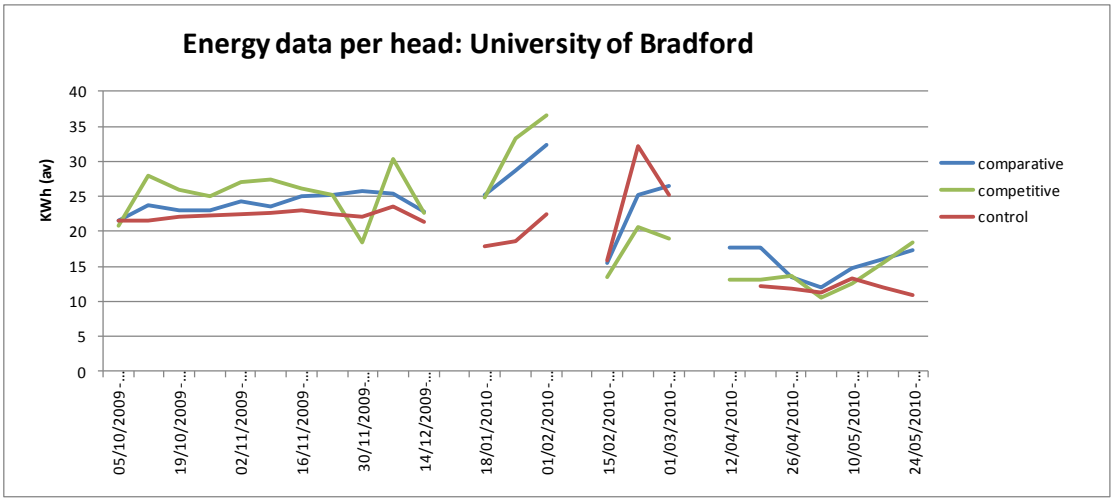

Figure 333. Energy data per head: University of Bradford

Survey results

Although, quantitatively, all three Bradford groups began with reasonably positive behaviours – with the control being the most energy-efficient – over the course of the research, there tended to be a negative change in behaviour. At post-intervention stage, there was a very slight increase in energy saving behaviour amongst the Comparative group, a slight decrease in the control group and a larger negative change in the Competitive group. At follow-up all behaviour change was slightly negative.

The effect for all three Bradford groups on habits is shown in Figure 34:

While there is much variation in terms of both habits and behaviours (as with the meter data), when compared to the control group, neither Bradford intervention was effective.

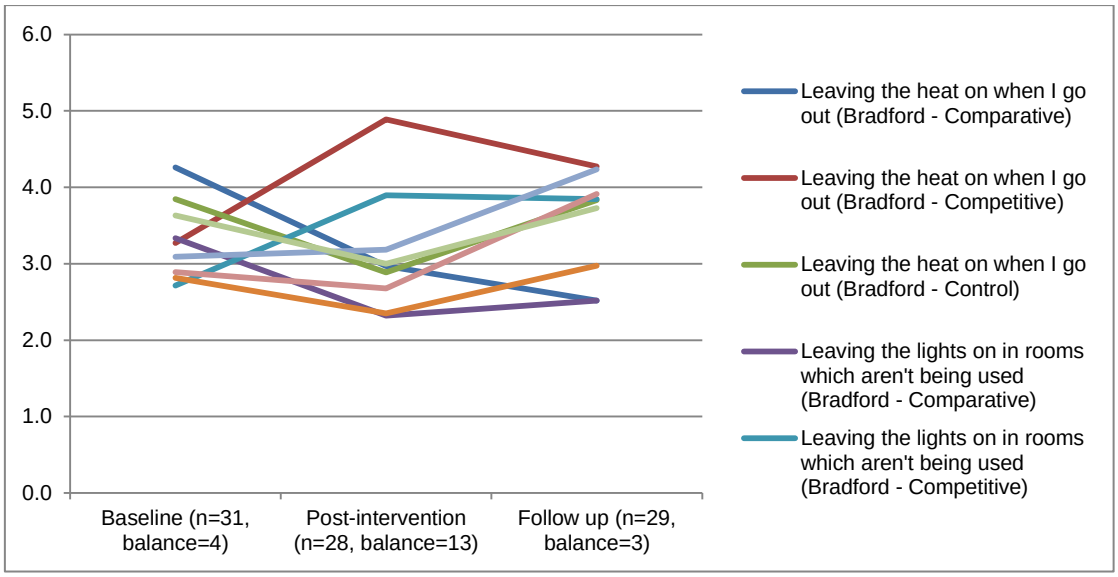

Figure 34. Change in energy habits across the intervention and follow-up period (Bradford)

Qualitative results

The general attitudes and concerns of students from the focus groups are covered in section 3.2.1.

With regard to the intervention, the findings from the focus groups were that some students felt **disempowered** by the scheme being at a floor level rather than at flat or room level. The floors contained a large number of people, only some of whom wanted to take part and many of whom did not know each other. This made it difficult for those who wanted to take part to succeed, if others did not take part.

> "*I think on a flat scale would work better, because you can influence your flat mates*" Cautious Participant, Bradford, Post-intervention Focus Group (Comparative)

> "*We don't spend much time with other people on the floor so it didn't really work. The people in your flat are who you talk to. You can be the lowest energy-using flat, but everyone else on your floor could be rubbish*" Concerned consumer Bradford, Post-intervention Focus Group (comparative)

The competitive element had some negative consequences, such as some students rebelling against the scheme by using as much energy as possible or cheating by switching things on in competing flats. However, the competitive element did have some positive results and was seen favourably by some students:

> *"I think we started to try to cut down on our electricity. Just because we saw that someone could do better than us. It wasn't because someone was winning. It was*

because they were doing better than us." Concerned Consumer, Bradford, Follow-Up Focus Group (Comparative)

"It was a bit annoying to think that they were winning" Positive Green, Bradford, Follow-Up Focus Group (Comparative)

A belief that the target was too difficult to achieve, though, led some students to **rebel** against the scheme.

"*I remember discussing that why should we do this, what's the point of competing with others when it's so there's no way to get cohesion, even on one side. So we made a thing to have the extractor fan on all the time, the oven on a constant setting*" Positive Green, Bradford Follow-Up Focus Group (Comparative)

Other criticisms of the schemes included a perception that statistics were not **updated** often enough, the similarity of the posters' design, and posters being covered up.

"*I must admit I was paying attention to them [the statistics], but they didn't really update them that often*" Positive Green, Bradford Follow-Up Focus Group (Comparative)

"*The posters looked the same every single time so you wouldn't know they had changed*" Positive Green, Bradford Follow-Up Focus Group (Competitive)

One student suggested that it was a case of preaching to the converted:

"The people who look at it don't really need to, and the ones who do just walk past", Positive Green, Bradford, Post-Intervention Focus Group (Competitive)

The lack of a financial **incentive** meant some students did not see the point of trying to win.

"*I didn't get involved because I didn't think I would have had any benefits*" Honestly Disengaged, Bradford Follow-Up Focus Group (Competitive)

Despite the criticisms of the intervention, some students believed that the intervention had positively affected their behaviour, or would have a positive effect on their future behaviour.

"*[Knowing how much energy other floors are using] generally made me more aware, and I started more energy saving habits because of that. I like the idea of being a bit competitive as long as it doesn't go too far*" Cautious participant Bradford Post-intervention Focus Group (competitive)

"*…it's made me more aware for the future, for when we go into our own housing when we're paying bills*" Cautious Participant, Bradford Post-intervention Focus Group (comparative)

Although students believed that the interventions made people more **aware**, they did not think that this translated into actions, although several reported taking steps to reduce their energy use after seeing that another floor had lower energy use than them. Additionally, some students already conducted energy-efficient behaviours.

"*It's good that it's there, but I was bugged so much at home I'm already pretty energy-efficient*" Waste Watcher, Bradford Post-intervention Focus Group (Comparative)

Overall, the results from Bradford indicate that a Comparative intervention may be more effective than a Competitive intervention, but not necessarily better than a control (given the lack of group identification). However, further longitudinal research is necessary to assess the long-term impact of both interventions once they have finished, and to test the interventions with smaller, more cohesive groups (e.g., flats). Additionally, as the sample sizes were relatively small, a similar study with a larger sample size would need to be conducted to verify the proposed findings.

3.2.6 Financial incentives (UWE)

Intervention summary
A financial incentive intervention was run across nine blocks of six houses, with two intervention groups and one control group.

- The control group of three houses received no financial incentive for reducing energy use.
- In one intervention group of three houses, students received £5 per month if they reduced their energy use by over 5% (Ceiling intervention).
- In the second intervention group of three houses, students received a variable payment dependent on the level of energy reduction, capped at £10 per month for a 10% reduction (Variable intervention).

Baseline differences

Baseline analysis (see Appendices 8 and 9) shows that, overall, the baseline positions of UWE Ceiling, UWE Variable and UWE Control showed much variance across the twelve behaviours and some variance across the three habits. Overall, UWE Variable showed the most energy-efficient responses for both habits and behaviours, with UWE Ceiling coming second in habits and UWE Control coming second in behaviours.

Meter data results

NB only electricity was metered and not used for heating so the metered energy use data does not include heating whereas the quantitative survey results include heating related behaviours and habits.

The meter data results for UWE were mixed. Overall, the Control group had lower consumption per head than the intervention groups combined before the intervention but this difference reduced after it – which suggests that the intervention might have reduced energy use. (Figure 35). When the two intervention groups are viewed separately, the difference between the two is apparent (Figure 36). Although the Ceiling group has much higher consumption than the Control group before and after intervention, the Variable group consumption relative to that of the Control group reduced during and after the intervention. This suggests that the Variable intervention has some effect in reducing energy consumption per head.

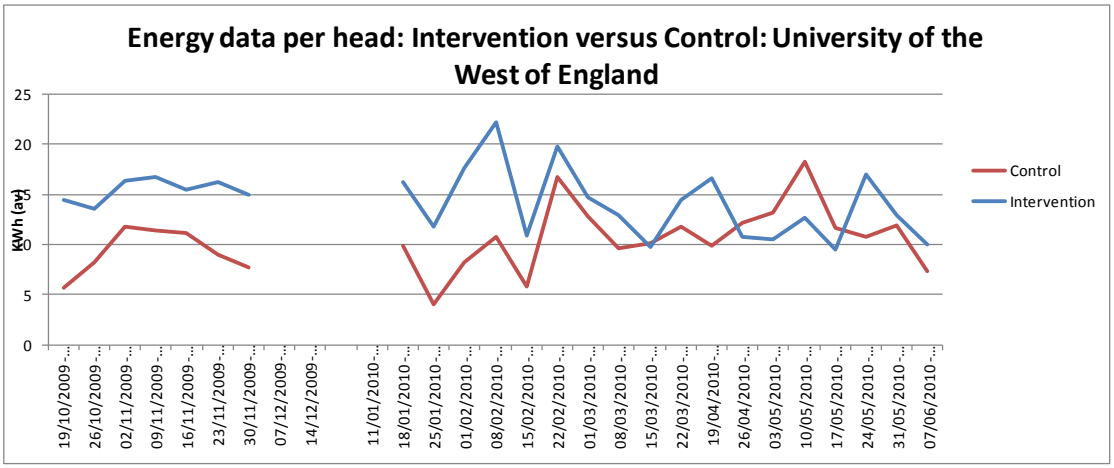

Figure 35. Energy data per head: Intervention versus Control: University of the West of England

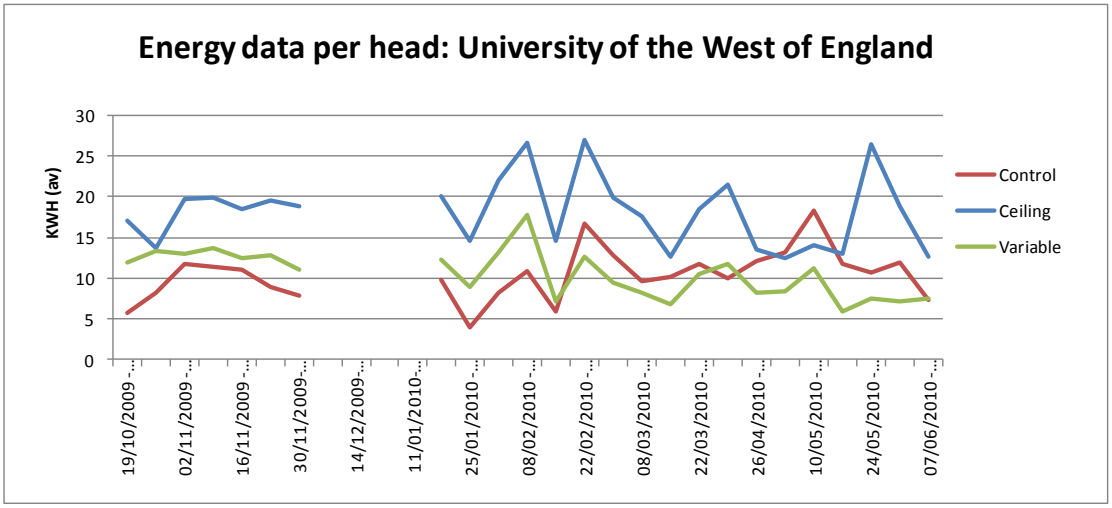

Figure 36. Energy data per head: University of the West of England

Survey results

Please note the very small base sizes at UWE when considering the quantitative findings.

There was some difference in baseline behaviours for the three UWE groups, with Variable incentives group showing the most positive environmental behaviours, UWE control showing some positive environmental behaviours and UWE Ceiling showing slightly negative environmental behaviours. However, all three groups showed positive behaviour change between baseline and post-intervention surveys, but with the greatest change in the control group. Between the baseline phase and the follow-up survey, the Ceiling group showed a high positive increase, the Variable group a small positive increase and UWE control a smaller positive increase. This suggests the Ceiling group achieved a positive behaviour change, (in contrast to the meter data which suggests that the variable intervention was effective and the ceiling not). Most change, however, occurred once the intervention had finished (see also Figures 37 and 38).

The results from UWE for leaving the TV on standby are of interest (Figure 37), as the control group shows a pattern typical of students in their first two years at university: first, students begin university with a certain level of behaviour, in this case a relatively neutral level of leaving the TV on standby; then, when students have settled in to living in halls of residence where bills are generally all-inclusive, the reported rate of leaving the TV on standby increases dramatically, evidenced by a steep drop in energy-efficient behaviour; finally, as students enter shared accommodation where bills are generally not included, there is a sharp decrease in the reported rate of leaving the TV on standby. However, the two interventions show markedly different results, both to the control group and to each other: the Ceiling group shows a small decrease in energy-efficient behaviour post-intervention when students are in halls of residence, followed by a large increase in energy-efficient behaviour at follow-up; the Variable group shows a very large increase in energy-efficient behaviour post-intervention, followed by a slight decrease in energy-efficient behaviour at follow-up. This indicates that the Variable intervention may initially have the most positive impact on students' behaviours, but this appears to decrease slightly over time. Conversely, the Ceiling intervention appears to be less effective during halls of residence, but potentially more effective in the long-term. However, due to the small sample size at UWE, further research is necessary to confirm these initial findings.

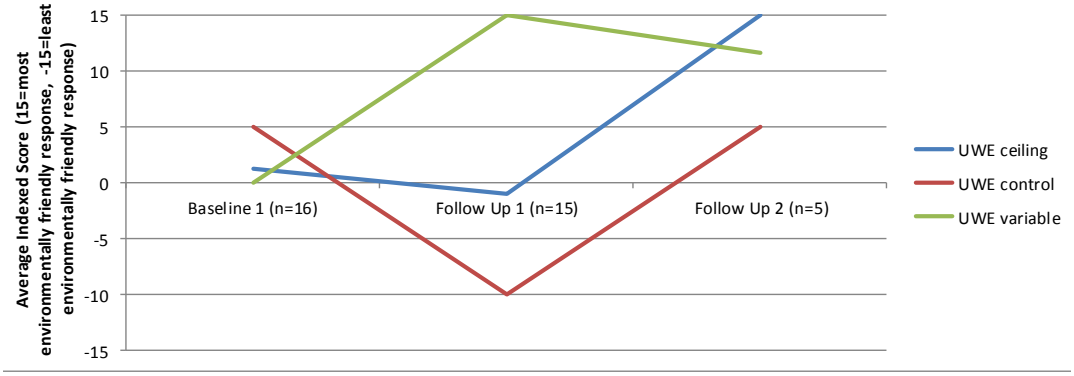

Figure 37. Year-on-Year Changes: "Leave your TV on standby for long periods of time", University of the West of England (n=36)

With regard to the three habits, all three UWE groups showed an initial neutral or slightly negative score. Changes within the timeframe of the study show that the three groups tended to develop more positive habits (see Figure 38). Overall, incentives appear more effective at inducing positive behavioural changes than positive shifts in habits, but results between the two interventions were mixed and largely occurred once students had entered their second year.

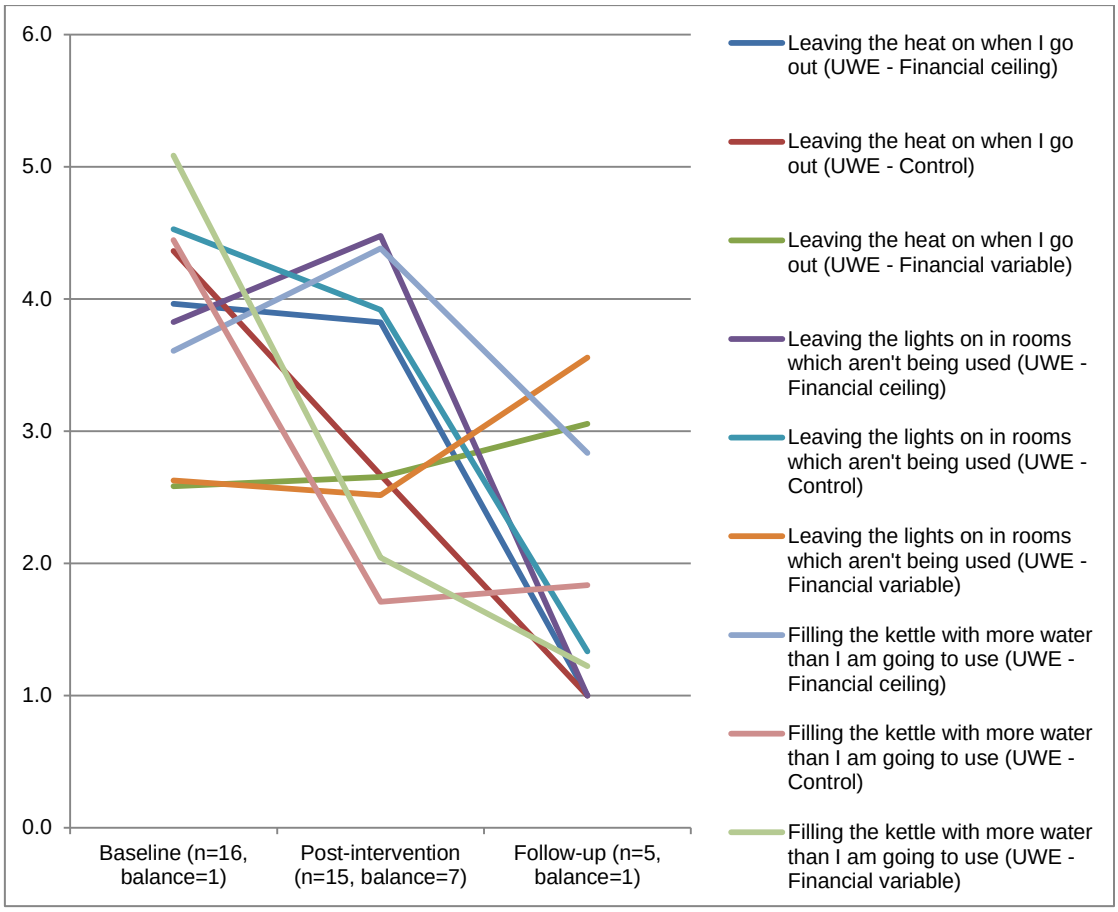

Figure 38. Change in energy habits across the intervention and follow-up period (UWE)

Qualitative results

The general attitudes and concerns of students from the focus groups are covered in section 3.2.1.

The findings from the focus groups were that the perceived overall success of the intervention was mixed. Although it did make some students conscious of the need to adopt energy-efficient behaviours, this did not always translate into **lasting** changes in behaviour.

> "*I think it's a good thing, because it made you think about it, even if it didn't make you do anything*" Concerned Consumer, UWE Follow-Up Focus Group (Intervention, Variable)
>
> "*…we tried to save energy but we kind of forgot after two weeks*" Positive Green, UWE Post-Intervention Focus Group (Intervention, Variable)

A widely held belief was that an incentive scheme focused on an **individual room** level would be better than the flat-level scheme that was carried out. This was because some housemates may consciously try to save energy while others may not.

> *"Maybe you could split it, because someone in the house could be really good, but another could have TVs and laptops and everything on*" Positive Green, UWE Post-Intervention Focus Group (Intervention, Ceiling)

Additionally, the incentive was perceived as being relatively **low**, meaning that some students decided to "opt out" and did not try to achieve the energy reduction, believing the incentive was too low.

> "*I didn't really [bother] because it's just a fiver*" Cautious Participant, UWE Post-Intervention Focus Group (Intervention)

One student suggested that they felt guilty for receiving financial rewards when they felt that they weren't deserved:

> *"[I felt] quite bad, because we didn't do anything. So it was like here's some money for doing nothing"* Concerned Consumer, UWE, Follow-Up Focus Group (Intervention, Variable)

In terms of other aspects of the interventions, many felt that the posters did not grab their attention or appeal to them.

> "*I noticed them but didn't really read them*" Cautious Participant, UWE Post-Intervention Focus Group (Intervention, Ceiling)
>
> "*I don't like maths or anything, so when I saw graphs I was put off*" Concerned Consumer, UWE Post-intervention Focus Group (Intervention)

Several students felt that further **explanation** of the scheme was necessary.

> "*I don't think we were really told about it, it just appeared on the wall*" Positive Green, UWE Post-Intervention Focus Group (Intervention)
>
> "*I think if it was advertised better more people would have taken notice of it*" Positive Green, UWE Post-Intervention Focus Group (Intervention, Variable)

Students indicated that they would like to have seen **social media** used to help advertise the scheme, and that messages with a shock value would be effective. Additionally, respondents suggested that posters could be supplemented by a **representative** who would explain the scheme to residents of the halls:

> *"Actually have someone talk to you first before the whole thing start you might take more action"* Concerned Consumer, UWE, Follow-Up Focus Group (Intervention, Ceiling)

Additional issues included the **timing** of the scheme and students not understanding the intervention.

> "*I think if the scheme was started right from the beginning of term it would have worked better, rather than starting half way through the term*" Cautious Participant, UWE Post-Intervention Focus Group (Intervention, Ceiling)
>
> "*I didn't really understand what was going on, I just knew I got £9 one week and less other weeks*" Positive Green, UWE Post-Intervention Focus Group (Intervention, Variable)

Overall, the **Variable** incentive tended to be reported as being more effective than the Ceiling incentive, because it was seen as more closely linked to behavioural effort and thus fairer. This resonates with similar findings from the quantitative and meter data results.

> "*I think the variable scheme is better, because you're incentivised to save more energy and get more money*" Positive Green, UWE Post-Intervention Focus Group (Intervention, Variable)
>
> "*It's not great that if you saved a lot more you'd only get £5*" Sideline Supporter, UWE Post-Intervention Focus Group (Intervention, Variable)

3.2.7 Energy saving training

Intervention summary

Energy saving training was delivered to a separate set of students at each university – i.e. students who were not part of the main intervention or control groups. These students were from any year of study to help provide a model of how habits could form and endure outside of halls of residence. The energy saving training aimed to empower students with the knowledge to reduce their energy bills and support others in houses of multiple occupancies and halls of residence. The objective of this was to understand the legacy of energy saving training and the qualitative impact of such, given that the five interventions tested within this research do not include any training or other enabling strategies beyond

The energy saving training was designed with the aim of equipping students with the knowledge to save energy during their time at university, without covering climate change or technical analyses. The slides used within this training are available in Appendix 5.

Analysis is based on the feedback obtained from online focus groups. The topic guides for these groups are available in Appendix 6. No quantitative data was captured. For this reason analysis of habits, behaviours and attitudes are not discussed in the same format as the five interventions.

The training appeared to positively affect the energy-efficient behaviours of the majority of students, as demonstrated below. Qualitatively this appears to have had more of a positive impact than the majority of interventions conducted within this research. However, note that online discussion groups were the only methodology used in obtaining feedback on the energy saving training sessions.

The first online focus groups occurred in March 2010, immediately following the Energy Saving Training. Due to the limited sample size, the focus group findings for each university are summarised in the following boxes:

Bradford (March 2010)

- The training was seen as a good reminder that reinforced students' ideas
- The online focus group allowed them to share their ideas
- Students felt they learnt a lot from the training
- They passed knowledge on to their family, but found it harder to do this with male family members and with their flatmates
- Those who didn't pay separate energy bills were less interested in changing their behaviours, but saw them as good habits to get into for the future
- Conducting energy-efficient behaviours made the students feel good
- Many students cared about the environment and felt it was morally right to behave in an environmentally friendly manner
- Several students reported struggling to shorten their showers, but changing phone charging habits was generally seen as easy
- Many students planned to carry on the energy-efficient behaviours

Durham (March 2010)

- Following the training, students noted that their previous ideas regarding energy efficiency were often wrong
- Students reported learning lots of small things
- The training generally reinforced what students already knew
- The training and online focus groups allowed students to share ideas
- Many found that gentle reminders to others, such as stickers, were best
- Many students had been brought up behaving in an environmentally friendly way
- Students felt guilty if they did not engage in energy-efficient behaviours
- Students were more likely to engage in easy actions
- Ensuring that actions become part of a routine was seen as important
- Many students intended to continue the habits they had developed
- Students enjoyed talking to others with similar attitudes in the online focus group
- Many students previously engaged in energy-efficient behaviours
- Other people's actions were often perceived as discouraging, but several students had tried to influence their flatmates

Leeds (March 2010)

- Students reported now realising the range of energy-efficient actions they could take
- Most found the information very useful
- Students reported generally only doing things that are easy
- Lots of students were interested in putting up stickers
- There was a widely held belief that it is good to get in the habit of doing these behaviours for students' upcoming year in shared accommodation
- Having a financial incentive was crucial to students taking part in the training
- Students found it easier once things became a habit and reported laziness as a barrier
- Parental influence was seen as being key
- Links to others who save energy was important to students
- Saving money is the main attraction of undertaking energy-efficient behaviours
- Many students previously did none of the behaviours
- Students found persuading others difficult
- Other people's actions were often discouraging, but several tried to influence their flatmates

UCLan (March 2010)

- Many students had not considered the money saving possibility of energy efficiency behaviours before the training
- The training was viewed as being an overview rather than actual training
- Students found information on how much energy is used by different appliances useful
- Many students tried to influence others to conduct similar behaviours, including family members, but found it hard to influence flatmates
- Several ordered energy efficiency stickers to display in their flats
- Students reported partly conducting such behaviours to help the environment
- Many hoped that such behaviours would become natural or part of their daily routine
- Other people's actions were often discouraging, but several tried to influence flatmates
- Students generally believed they would carry the behaviours on
- Future suggestions include developing a Facebook page for energy efficiency tips and information sharing
- Students now generally do everything they can, but most carried out far fewer behaviours before the training
- Some thought it would have been useful to have an expert in the online discussion

UWE (March 2010)

- The training acted as a reminder for many students
- Students' overall reaction to the training was less positive at UWE than the other universities
- Many students reported wanting to help the environment and as well as wanting to save money

The second set of focus groups were conducted in October 2010 and aimed to look at any longer-term impact of the energy saving training:

Bradford (October 2010)

- The training had a lasting positive impact on behaviours overall
- Students were less likely to conduct behaviours perceived as more awkward
- Students struggled to change the behaviour of flatmates and family
- Many found that the energy-efficient behaviours had now become habits
- Once students had adopted energy-efficient behaviours, accommodation changes did not appear to affect their energy-efficient behaviours

Durham (October 2010)

- Students had some awareness of energy efficiency behaviours prior to the training, but many reported needing information to take away with them following the training
- Students tended to do things for environmental reasons, not generally to save money
- Those students who were part of the focus group tended to be take responsibility for environmental issues within their houses

Leeds (October 2010)

- Students had forgotten many of the tips and reported needing a summary sheet
- Students initially increased their energy-efficient behaviours, but this then decreased
- Energy saving behaviours were generally conducted for financial reasons, followed by environmental reasons
- Whilst living in houses, students found some behaviours hard to conduct, such as recycling

UCLan (October 2010)

- Students found information on the energy use of applications useful
- The training made students more certain of the importance of energy-efficient behaviours
- Many felt that the training should have been more in-depth and less simplistic
- Some students reported certain behaviours having become habits
- Students engaged in energy-efficient behaviours due to concern for the environment and financial reasons
- Actions tended to be focused on smaller, easy to achieve actions

UWE (October 2010)

- Generally, students found the training useful and engaged in many of the actions
- Students reported that money-saving in shared accommodation has had a big impact
- Money was seen as the main motivator for behaviour change, with the environment being a secondary motivator
- Students felt that some behaviours were becoming habits
- Students found it difficult to control their housemates' energy behaviours

Whilst many students cited economic factors as driving continued energy efficient behaviours, the majority of respondents felt that the energy saving training had supported them in continuing energy efficient behaviours which may otherwise have been lost at university. Consistent with the intervention groups, there was social inertia in encouraging others to save energy, with some respondents citing their peers as being dismissive, and others feeling that they lacked the confidence to raise this topic with their peers.

Therefore there are qualitative indications that energy saving training acts in a similar fashion to the interventions in place in supporting habit maintenance rather than habit adoption, but does not broach the topic as a conversation piece in as effective a manner as the interventions, which gave some students the vocabulary and stimulus to discuss the interventions with their peers.

Furthermore students at the energy saving training had actively selected to participate, rather than the students within the interventions who were notified of their inclusion within this action based research and given the option to withdraw if they were uncomfortable with that. Whilst the Defra segments were represented within the energy saving training, it is possible and likely that these respondents were more likely to feel enthusiastic about the training which they had personally elected to take part in. This could go to some lengths in explaining the positivity around the behaviours included in this project versus that of the interventions themselves.

3.2.8 Second year case study

Intervention summary
A second intervention at Durham took place in the term immediately after the original intervention ended. One of the blocks that received the original awareness campaign material was selected and received three email communications outlining actions they could take around their flat to save energy. Additional questions were asked of these students during the final focus group and within the second quantitative follow up survey to assess whether the second intervention helped maintain or increase energy-saving habits.

This section is focused on the qualitative sample rather than quantitative insights, as only four out of 58 respondents (around 7%) in the survey recalled the email communications. Of the four who recalled the email, two were unsure whether the intervention had affected their energy use, one thought it made them use less energy and one that it had had no effect. For this reason analysis of habits, behaviours and attitudes are not discussed in the same format as the five interventions.

However, the focus group conducted with this group revealed more positive results, with four of the seven participants recalling the emails. Despite this, most participants were **critical** of the emails for reasons including that the images took too long to load, that the emails added to the large amount of junk mail they already received, and the perceived irrelevance of web links provided. They were also seen as too similar to previous emails. Suggested improvements included explicitly outlining potential

financial benefits in the subject heading and linking email content to empirical **evidence**. Overall, students did not see the additional intervention as having encouraged them to adopt energy saving behaviours, but thought that the scheme could potentially do this in the future if modified.

> "*From my perspective they [the emails] remind me of the ones that I got last year, the lack of useful information in those last year made me not read the new ones*" Cautious Participant, Durham, Follow-Up Focus Group (Second year case study)
>
> "*I thought that the subject suggested it would be a list, because it was a full image it took a while to load and it was just one tip, it was pointless*" Stalled Starter, Durham, Follow-Up Focus Group (Second year case study)
>
> "*We get so much rubbish into our university e-mail accounts that I only read it if I'm expecting an e-mail*" Sideline Supporter, Durham, Follow-Up Focus Group (Second year case study)
>
> "*I think if people don't want to do it they won't do no matter how many e-mails they get, and if people do want to do it they will*" Stalled Starter, Durham, Follow-Up Focus Group (Second year case study)

3.3 How did interventions affect different groups/segments?

Some differences in the impact of the interventions according to demographic factors and Defra segment were noted and are discussed in this section (the data enabling segmentation was from answers to the questionnaires given in Appendix 3).

3.3.1 Habits by home status and gender

In this sub-section, we focus on variation by home status and gender, which are the demographic factors with the greatest variance within the sample. (Age shows little variation, since most participants within the sample are aged 18-19).

As Figure 39 shows, the home status categories have very close scores for the three habits. Of the three, EU citizens were the most energy-efficient, closely followed by UK citizens, with international non-EU students appearing the least energy-efficient. However, the differences are negligible.

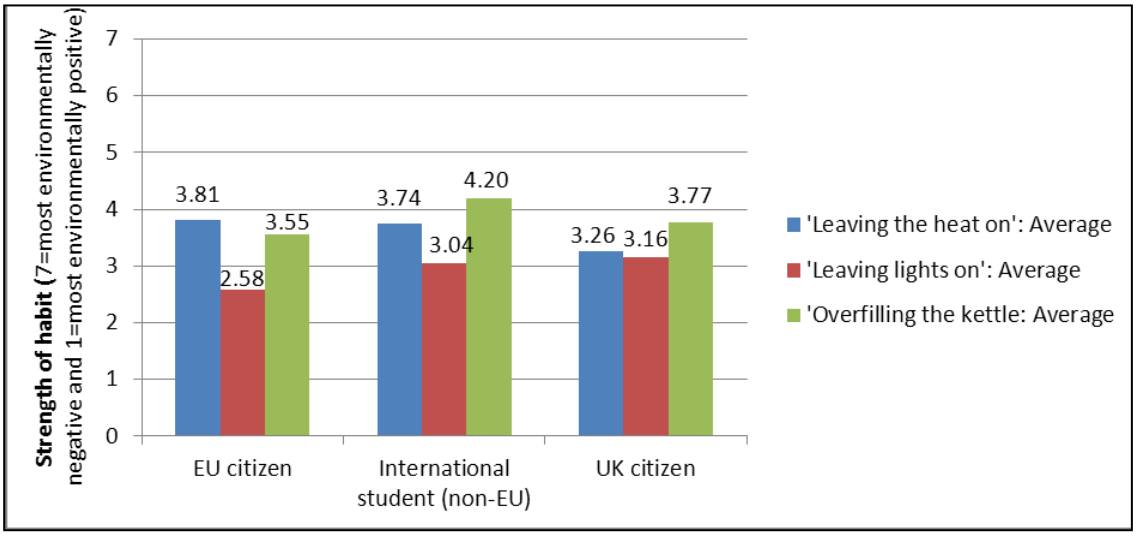

Figure 39. Average Indexed Score of habits by home status at follow-up (n=147)

As shown in Figure 40 below, females appear to be moderately more energy-efficient in their habits than males according to the follow-up survey. This is consistent with previous research, which tends to show women are more environmentally-conscious than men (e.g., Stern et al., 1993).

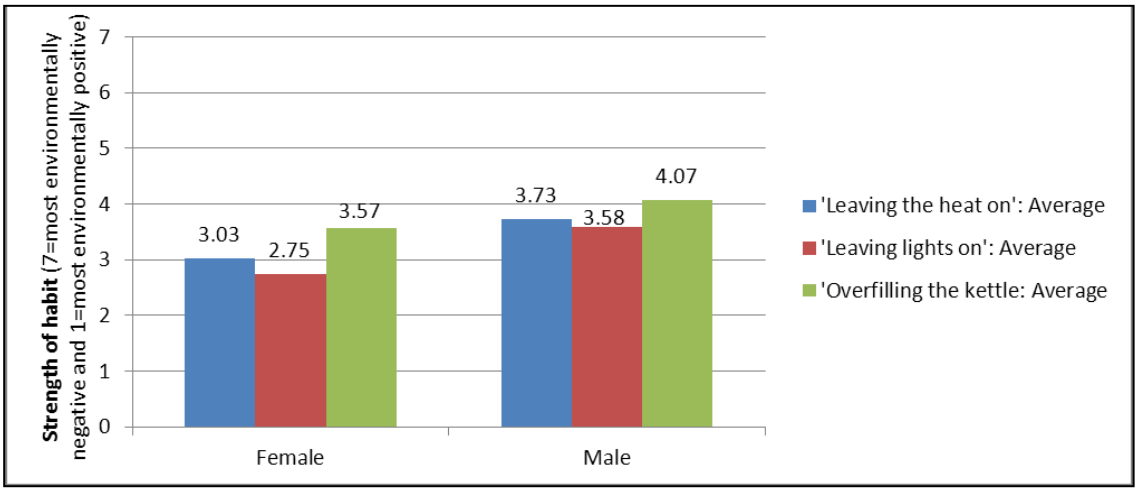

Figure 40. Average Indexed Score of habits by gender at follow-up (n=147)

3.3.2 Defra segmentation types

Due to the limited sample size, it was agreed with Defra that correlation between attitudes, behaviours and habits across the intervention and control groups would not be explored. However, one key aspect of this research did look at how the interventions had affected different types of students, according to Defra's seven segmentation types. In several of the following tables, the segmentation types are grouped as follows in order to allow meaningful analysis:

- **More engaged** = positive greens, cautious participants and concerned consumers
- **Less engaged** = honestly disengaged, sideline supporters, stalled starters and waste watchers

In the following tables, colour coding is reversed so that for the 'less engaged' group dark red represents a large negative change and dark green a large positive change and for the 'more engaged' group dark green represents a large positive change and dark red a large negative change. However, due both to small numbers of respondents within some groups and large differences between the numbers of respondents for some groups, these results are purely indicative and require further additional surveys of a larger sample to verify them.

As outlined, several of the surveys had a low number of respondents – partly due to the research design – and for this reason, the following two tables show the results split into 'Interventions' and 'Controls'. This gives a general overview of the effectiveness of the interventions compared to the controls. Due to the large difference in number of respondents between Baseline and Follow-Up for the control groups, the following results have been calculated excluding Durham (Durham had the largest discrepancy in respondent numbers and also had no control data for Follow-Up).

Percentage change between Baseline and Follow-Up: More versus less engaged (excluding Durham)		
	More engaged	**Less engaged**
Interventions (average change) (B1: n=66; FU2: n=50)	1.5%	-11.0%
Controls (average change) (B: n=31; FU2: n=18)	7.1%	-9.1%

Figure 41. Percentage change between Baseline and Follow-Up

Figure 41 above indicates that, overall, both control and intervention groups polarised during the course of the study – with the engaged groups becoming more engaged, and the less engaged becoming further disengaged. Further research would be needed to identify any participation effects experienced by control participants.

Below, Figure 42 shows the same results broken down into individual segmentation types. This shows that there are differences in the magnitude of changes in segmentation type between the intervention groups and control groups as a whole over the period of intervention. For instance, interventions overall led to a large decrease in Honestly Disengaged, whereas the Controls overall led to only a small decrease.

Percentage change between Baseline and Follow Up (excluding Durham)							
	Cautious Participants	Concerned Consumers	Honestly Disengaged	Positive Greens	Sideline Supporters	Stalled Starters	Waste Watchers
Interventions (average change) (B1: n=66; FU2: n=50)	0.8%	-4.8%	-12.3%	5.6%	-2.3%	0.5%	3.1%
Controls (average change) (B: n=31; FU2: n=18)	-1.6%	-0.7%	-1.8%	9.3%	-5.6%	0.2%	-2.0%

Figure 42. Percentage change in Defra segmentation type between Baseline and Follow Up (excluding Durham)

4 WHAT WE LEARNT

This section summarises key findings, including which interventions worked best for which groups of students. It also outlines suggestions for influencing behaviour, based on these findings. Finally, it outlines limitations and offers methodological reflections and suggestions for future research.

4.1 Summary

This research project was based on the premise that individuals are more likely to adopt new habits during a period when they are undergoing a life transition and their habits are thereby disrupted. First year students in higher education, living in halls of residences, are often living away from home for the first time, but pay fixed residences fees and do not receive feedback on their energy consumption. Therefore in a period of habit formation, the cues to encourage the formation of energy-efficient habits are not in place. The project aimed to address this through a set of interventions targeted at a sample of first year students and focused on energy-efficient behaviours.

The core of the project involved five behaviour change interventions, implemented at five different universities. These interventions can be mapped against the factors identified as key elements of behaviour change interventions in the '4E's' model devised by Defra[4]. The four key elements of this model are as follows:

- Enable (e.g. removing barriers, giving information, providing facilities, offer training)
- Engage (e.g. personal contact, media campaigns)
- Exemplify (e.g. leading by example)
- Encourage (e.g. reward schemes, recognition, penalties)

The first intervention involved an information campaign at Durham University (Enable); the second involved peer-to-peer encouragement at the University of Leeds (Engage, Encourage); the third, at UCLan, involved raising awareness of the energy efficiency of the built environment (residences or the whole university) (Enable, Exemplify); the fourth used comparisons with others' or with past behaviour to encourage behaviour change at Bradford (Enable); while the fifth, at UWE, involved financial incentives (Encourage). Each of these interventions aimed to change students' energy behaviours within halls of residence, but through different mechanisms and drawing on different academic findings and theories. Two additional case studies were included in the project to further explore behaviour change. The first involved intensive face-to-face training in energy efficiency behaviours (Enable). The second was a second year study on habit persistence, conducted at Durham University, which involved an email information campaign (Enable, Engage).

The student samples for the interventions and survey data were small. This was partly inevitable due to limited student numbers in each residence and the resource intensiveness of action research; but also because of challenges of recruiting participants to the research. Also there were inconsistencies between the survey results

[4] The 4 E's model was developed by Defra. It suggests that behaviour change can be catalysed by Enabling, Engaging, Exemplifying and Encouraging change.

and energy metering in terms of coverage (in some cases the latter included heating in others it did not). Therefore the conclusions which can be drawn from the quantitative data in terms are limited, particularly in terms of the relative effectiveness of the different interventions. The qualitative data in which the issues at each university were explored in depth can help offer more meaningful insight into the scalable outcomes of the project than the quantitative research.

The following discussion is set against the original aims of the research, and is followed by a discussion on the overall qualitative findings as a major result of this work.

4.2 Discussion of results versus project's original aims

Some aspects of the research, particularly the small sample sizes limiting the value of the quantitative findings, means that it was not possible to meet the original aims in full. This is discussed in this section by each aim:

4. 2.1 To examine the effectiveness of a range of interventions for encouraging energy-efficient behaviour in halls of residences

The small sample sizes and other aspects of the research in practice (see section 2.5, limitations, for details) meant that the quantitative data can only give an **indication** of the effectiveness of the different interventions. It is not possible to be definite about the effect of each intervention or the relative effectiveness of one intervention relative to another

Overall, we found the interventions tended to *maintain* pre-existing energy saving habits, which otherwise may have been lost due to prevailing disincentives to save energy in halls of residence. These interventions do not seem to be enough on their own to (notably) increase habit formation during a moment of change. This reflects the need to adopt a comprehensive approach, such as has been outlined in the 4 E's model of behaviour change (see Appendix 1). However, the interventions are linked to attitudinal change and more frequent spontaneous awareness of methods of energy saving, and represent an important opportunity to prevent the loss of energy saving habits instilled through parental insistence and education. Interventions most likely to initiate energy saving action, and potentially stimulate habit formation, are those that offer individuals:

- **feedback** on their progress,
- social **support** and motivation,
- clarity on their own ability to **control** outcomes, and
- **incentives** for personal gain

4.2.2 To examine differences in the effectiveness of the interventions amongst different segments and demographic groups

As for the first aim the ability to look at differences is limited by the quality of the quantitative data – the results are indicative only.

The interventions differentially impacted on male and female students, the latter being more environmentally engaged, which is consistent with previous research (e.g., Hampel et al., 1996; Stern et al., 1993). Our analysis also suggested energy behaviours changed differentially between Defra segments: environmentally conscious/active segments showing more positive change, and less engaged segments showing more negative change. However, there is no consistent difference between intervention and control groups suggesting these groups polarised over the course of the study irrespective of the interventions.

Furthermore, minor variations exist between the qualitative and quantitative data; specifically, the qualitative data does not show expected differences between segments in attitudes and reported behaviour. This is not wholly surprising, since segmentation is a population-based statistical – not individual – categorisation. At the same time, differences between segments could not be statistically identified due to small sample sizes. In any case, as noted above, many of the key factors for success in changing energy habits outlined above (social influence, control, etc.) are generic and cut across segments.

In terms of motivators/influences on behaviour change, we found that a variety existed including parental insistence and formal education, peer influence, perceived control, altruism, and financial motivations. These motivations were strikingly similar across Defra segments, as were many of the barriers to energy saving (e.g., perceived lack of control or incentives) identified by participants.

We also note that energy consumption is significantly influenced by the built environment (i.e., well-insulated/low-emission buildings vs. older inefficient buildings); such that the largest variation in energy use was observed between universities rather than between flats or segments (taking into account the fact that heating fuels were not metered in some cases).

4.2.3 To explore the adoption of energy saving behaviours in the context of habit formation

As noted in section 4.3.1, the interventions served more to maintain pre-existing good habits – usually instilled by parental insistence (and in some cases through school education) – than to create new energy-saving habits. However, our results also indicate the significant potential of the transition to private accommodation in students' second year as a 'moment of change' in which energy saving becomes a priority due to having control over energy bills and the capacity to be financially rewarded for efficiency efforts. Thus greater potential to increase habit formation may be seen in targeting students moving from halls of residences into privately-let accommodation, particularly where students take responsibility for their utility bills. Further research opportunities lie in understanding the wider implications of this, and the potential for partnerships with student letting agencies.

4.2.4 To explore the persistence of energy saving behaviours beyond the original contexts, following students after they leave halls of residences and move into private accommodation

There was very little quantitative data from the second year intervention or the follow up surveys with the intervention groups – most of the data is qualitative. As students move into private accommodation in their second year, their awareness of energy saving seems to be much more likely to manifest in behaviour change than in the first year at university when there appears to be little motivation to save energy, and sometimes structural or social barriers to doing so.

4.2.5 To understand the most appropriate ways of targeting university students in terms of encouraging pro-environmental behaviours for the future

As discussed, our analysis found that using a range of different approaches to encouraging behaviour change is likely to be more effective than any single approach on its own. However the strongest change in behaviour we observed was in the move to private accommodation, since paying one's own bills was a very powerful motivator for energy saving amongst students.

This important moment of change, namely the transition to being a bill payer (i.e., having financial responsibility) is a key lesson from this research. As we suggest below (section 4.4 implications for influencing behaviour), future interventions to shape students' energy habits should probably focus on the second year at university when financial independence and bill paying commences. Landlords and letting agencies may thus be important messengers and intermediaries for energy saving advice for this target group.

4.3 Qualitative findings

The overall qualitative findings are a major result of this work and are therefore discussed separately here.

4.3.1 Overall attitudes

The baseline findings were that most students arrived at University with energy saving awareness due to training at home, influence from parents, and to some extent from school. (A discussion of the range of attitudes by segment is included in section 4.3.2 below). Some adopted these behaviours and habits as their own and carried on with them, due to environmental concerns. However, to others leaving home offered the opportunity to rebel against these imposed values. The latter tendency was reinforced by the situation in most halls whereby a fixed rate is charged for accommodation and utilities so cost is independent of energy use. Many students took this as a licence not to worry about their energy use, an attitude reinforced by the change to a student lifestyle which many felt was not compatible with energy saving (there were too many new things going on, people to meet, things to cope with – thinking about energy was just too hard).

The comments from the focus groups involved in the interventions but still in the first year (while living in halls of residents) were not significantly different from those before the interventions. Indeed one of the most striking things about the qualitative results is their consistency across the first year and all the campuses. It was only when students moved into accommodation where energy was metered and charged separately that students reported their attitudes to energy saving behaviour changing – with the financial incentive most students became focused on keeping the bills down and

adopting energy saving behaviour. Unsurprisingly this is one of the main findings – that the connection between savings energy and saving money is mentioned again and again and is one of the core reasons for energy saving.

Other consistent themes of focus group comment were:

- Perceived **lack of control** over energy use in hall. While the research had checked that the advocated energy saving behaviours were possible in students' circumstances many students felt that they did not have control of their energy use and this meant that they rejected advice or encouragement to adopt them.
- The **strong role of peers** in influencing behaviour. Many students reported seeing others 'not bother' meant that they were disinclined to make an effort. Others said that when they tried to influence their flatmates positively they were ignored. However when they were able to harness the power of a group the results were very positive. Researchers noted that the behaviour in the focus group themselves reflected this strong 'peer pressure'– most students were keen not to stand out from the crowd.
- **I will if you will.** Their concern that the university authorities don't either practice what they preach or do enough to encourage the students to save energy. Students tended to justify their lack of action by the perceived poor performance of the authorities – quoting very inefficient buildings in particular as evidence that they didn't really care about energy and the environment – that this was lip service. This finding reflects the call for leadership from central Government and business expressed by the general public more widely[5].
- **Financial control.** The awareness that their energy behaviour will probably change in future in different circumstances. Most students in halls recognised that they would act differently when they were paying energy bills. Looking further ahead some looked forward to a time they would be financially comfortable and wouldn't need to worry about this and could use energy as they liked; whereas others thought that they would continue to be careful for environmental reasons.

4.3.2 Attitudes to the interventions

The responses of the students in focus groups to the interventions were not encouraging. All of them were criticised and generally the majority felt that they would not produce a long term effect. (It is possible for individuals to be more influenced than they think by campaigns but the small sample sizes and other limitations of the quantitative data meant it was not possible to test this).

Students found that the material in the **Information** intervention (Durham) was dull, not optimally placed, reminded them of what they already knew and, at best, had only a short term effect. Overall, the intervention was seen as useful for students who had not been brought up to behave in an energy-efficient way, but was not perceived as useful by those who had.

The majority of students had similar comments on the **Peer-to-peer** intervention (Leeds) – they were critical of the design and placing of the posters and leaflets and felt

[5] See for example Sustainable Development Commission. (2006). *I will if you will*, http://www.sd-commission.org.uk/data/files/publications/I_Will_If_You_Will.pdf

that it had limited effect. The suggestions for improvement included having reps that were more personable, funny and interactive.

The same criticisms occurred in the **energy-efficiency of halls or university** (UCLan) The general consensus was that the posters were telling students to do things that they already did and were dull and repetitive and felt that the intervention had limited or no effect. They suggested that using a more interactive approach, using webmail or social media, or providing some kind of incentive would be more effective.

The main criticism of the **Comparative and Competitive** interventions at Bradford was that the 'unit' used was a floor of the hall, not individual flats (this was done because of the metering arrangements). This meant that there was no sense of shared identity to motivate change. Others reflected the comments common to all the interventions – that the posters were dull and not updated often enough. Some students felt that they needed an incentive to engage with the process.

The unit size was also an issue for the **Financial incentives** intervention (UWE); students would have preferred to operate on a room by room basis as flatmates has different responses to the campaign and these got averaged out. The incentives were felt to be too small to be effective although the variable incentive was felt to be fairer than ceiling (flat rate). Again the intervention was felt to have been of limited effect. Students felt that the use of social media and a representative to explain the scheme would have helped.

Students were generally more positive about the effect of the in-depth **energy-saving training** at all the Universities both in the immediate and longer term; this may have been because they chose this activity. Nevertheless the effects were felt to be limited when the financial incentive of paying bills was missing.

The **Second year** case study at Durham was also felt to be ineffective. Some of the students didn't remember or thought that they hadn't opened the emails that they were sent and those that did were critical of the format and content.

4.3.3 Conclusions from the qualitative findings

None of the interventions was felt to be effective and the students were critical of all of them. Some of these criticisms seem justified (the lack of engagement by the peers in Leeds, the choice of floors rather than flats as units in the comparative and competitive interventions at Bradford), although unavoidable in the circumstances. It is clear that the detail of how the intervention is delivered is critical to its effectiveness. This suggests that careful design and some form of piloting of interventions are necessary to achieve the best results.

Also, it is noticeable that whichever type of intervention was made that students asked for something else. This suggests that using the whole range of approaches simultaneously would be most effective; different students react better to different methods and the varying devices should reinforce each other.

Still the comments from the focus groups suggest that students at their first year at university are 'naturally resistant' to interventions to change their energy use behaviour. This is for a number of reasons chiefly;

- there is no financial incentive to encourage them to do so (and scheme incentives are seen as artificial and may be resented)
- they are at a point in their lives when they are likely to rebel against advice from previous authority figures (their parents and schools who had trained them in energy saving habits and behaviours) and critical of current authority figures (the university and anyone who is telling them what to do)
- they are undergoing a major change in lifestyle but when living in hall feel that they have only limited control.

The results suggest that a more appropriate point to intervene is when students p[ay their energy bills directly, generally at the start of the second year, providing them with a direct financial incentive to save energy.

The implications of these result for influencing behaviour are discussed in the following section.

4.4 Implications for influencing behaviour

Based on the above findings about the drivers and barriers of energy saving behaviours and the impacts of the different interventions, we make the following suggestions for influencing behaviour:

- *Use multiple interventions in multiple contexts:* A combination of interventions is likely to work best to influence students' energy behaviour due to the range of motivations and barriers to behaviour change. Given the important influence of parental insistence and formal education, peer influence, perceived control, altruism, and financial motivations, effective interventions are likely to include *informational, social, normative, and financial* measures targeted at *multiple time points and in multiple contexts* (e.g., school, home, halls of residence, private accommodation, university buildings, etc.)
- *Target interventions to the right moment of change*: Second year at university may be a more significant window of opportunity to engage students in energy saving, since this is where the external (i.e., financial) incentives for behaviour change are greater. Designing suitable interventions needs to involve relevant delivery agents, such as landlords and letting agents. Since this research took place, NUS has provided funding to projects involving the engagement of landlords through the HEFCE funded Students Green Fund[6]. Examples include Staffordshire University Students' Union, University of Sheffield Students' Union and the University of Worcester Students' Union are working to engage students and landlords in energy efficiency through techniques including auditing, smart metering and financial incentives for both landlords and tenants. Although second year at university may be a more significant window of opportunity, interventions in the first year may act as useful lessons or practice to be drawn on in the second year (e.g., as at UWE, Leeds)
- *Design and locate information appropriately*: Information should be located where behaviour is carried out (e.g., by light switches, kettles); and given competing informational demands, emails tend to be ignored as will posters in the wrong

[6] Please see www.studentsgreenfund.org.uk for full details

place or which are not eye-catching. Since there are different preferences for informational content (images, statistics, etc.) and how to receive energy information, a mix of designs and formats may be most effective at engaging large numbers of students.

- *Choose and train peer representatives carefully so that they engage well with their fellow students:* Peers should be well briefed, enthusiastic and be able to communicate well in order to be effective.
- *Provide information early and dispel misperceptions*: Since a common barrier to energy saving is perceived lack of control, this suggests a need for educational/or infrastructural interventions. Where students are unaware of energy saving behaviours that they can carry out in their halls of residence, there needs to be more focus on educating students about this when they start university
- *Target intrinsic and extrinsic values*: Competitive interventions often motivate students but they may backfire if measures to avoid cheating are not implemented; these might include better security between floors. However, any scheme which encourages energy saving for purely financial or material reward reasons risks this kind of behaviour as a side-effect. A better approach is likely to be to motivate change for *both* environmental and financial reasons.
- *Target 'meaningful' social groups*: Norm-based messaging (i.e., comparative or competitive) only works under certain conditions, and may even lead to an increase in energy use (i.e., those who consume less than the comparison group will tend to bring their energy use *up* to the group standard). This approach requires target individuals to feel part of and identify with the group (e.g., flat rather than whole floor) they are being implicitly linked to.
- *Structure incentives appropriately:* Utilise variable rather than fixed financial incentives (i.e., responding to amount of energy used – a more accurate signal) and at an appropriate level. Non-financial incentives (e.g., cinema tickets) may work better in some cases than financial ones.

Scalability

In terms of scalability, the variation in energy use according to building construction highlights the need to complement behaviour change measures such as those explored here, with *broader planning and other policy changes*. Crucially, though, the energy-efficient halls intervention here suggested there may be a risk of rebound effect (i.e., *increased* energy use due to assumed efficiency of the building) if the environmental credentials of buildings are highlighted without motivating students to change their behaviour, too.

Bearing these findings in mind during project design, there is considerable potential for scaling the interventions trialled here. In the time since this research was conducted, NUS has built upon the findings of this research in particular through its Student Switch Off programme which is now operating on a national basis in 54 institutions (2013/14 academic year). This programme incorporates a number of the elements studied in the interventions delivered for this research, for example incentives, information, competition and peer-to-peer engagement. Individual elements are also being trialled in different contexts, in particular the private rented sector. Examples here include

University of Worcester Students' Union's Energize Worcester project (a recipient of the Students' Green Fund) whereby students are encouraged to upload meter readings to an online system that allows them to track how much energy their home is using. Students have also been visiting private rented accommodation, offering advice on a peer-to-peer basis.

4.5 Implications for ABR projects and future research

The strengths of using action-based research (ABR) in this project have included grounding research in participants' experiences and local delivery partners' expertise; and being flexible to adapting or refining research design in response to changing circumstances/findings.

However, we also encountered various challenges which may comprise research quality (e.g., difficulties recruiting sufficient participants due to competing activities and low interest in energy/environmental issues; timing/impact of research and interventions in relation to external pressures/activities, e.g., freshers' week, exams; lack of buy-in or resources by some local delivery partners, as well as different approaches to intervention delivery, which compromised comparability; miscommunication and technological problems leading to gaps in data collection). In part, these difficulties were overcome by using multiple methods (qualitative, quantitative and outcomes data) and adapting the research design during the project (e.g., increasing incentives for participation and using additional recruitment methods; including individual interviews as well as focus groups; adapting intervention materials to emerging attitudinal findings; extending the research into the second year).

In order to avoid similar difficulties in future ABR research, we suggest:

- Early and regular communication with all partners (researchers, delivery agents, funders, volunteers, etc.),
- Thorough testing of equipment (e.g., energy meters) at all locations, and dry-run of data collection,
- Testing of content and context of intervention materials, e.g., via focus groups, to ensure resonance and suitability of actions targeted, and
- Ensuring peer-to-peer reps are fully trained and can targets approaches to different audiences.

Finally, we suggest that future research might focus on the transition to students' second year as a moment of change and particularly consider whether landlords and/or letting agents might represent important intermediaries for encouraging energy saving amongst students as they take on energy management responsibilities for the first time. The Government's new Green Deal scheme, where the costs of making a building more energy efficient are attached to the consecutive occupants through energy bills, rather than the owner or landlord, provides a new and exciting opportunity to inform and motivate large numbers of students in energy saving actions, and hence be of interest in terms of attitudes and behaviours. Such a study might also consider other (non-student) populations at the same formative stage of life (i.e., aged18 to 24) and consider mechanisms for fostering energy durable saving habits.

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