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Social Marketing–Enhanced Home Energy Education Encourages Adoption of Energy-Saving Practices

Abstract

We developed a program centered on a social marketing–enhanced home energy education visit to encourage homeowner adoption of specific energy conservation measures. We randomly assigned 170 homeowners to an experimental condition that included energy education before an energy audit or a control condition that included only an energy audit. Participants in the experimental condition adopted more no-cost and low-cost one-time energy conservation changes, such as adjusting refrigerator/freezer temperatures and lowering hot water temperature. However, they did not invest more in home energy renovations or other costly changes, such as replacing inefficient appliances. We discuss implications of this experiment for enhancing effectiveness of Extension-based energy education programs.

Keywords: energy education, energy educator, social marketing, residential energy use, energy conservation

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Introduction

Harnessing Extension's strategic position in the community, Extension program developers are offering Green Living expositions, consumer energy kits, and in-home energy education led by volunteer "climate masters" and "energy navigators" (Diehl, Swenson, & Wente, 2012; Kirby, Chilcote, & Guin, 2005; Mazze & Stockard, 2013; McAden, 2019; Romich, 2015). These programs focus their educational campaigns on actions homeowners can take, from making no-cost and low-cost behavior changes to investing in home energy retrofits. Extension educators have advocated for not only providing information but also using social marketing to encourage energy use behavior change (Kumar Chaudhary & Warner, 2015; Martin & Warner, 2015; Sanagorski, 2014; Skelly, 2005). Developers of programs such as the nationally available Climate Masters at Home program are taking up these recommendations and using social marketing principles such as goal setting and commitment as part of their motivational strategies.

Correlational studies of such social marketing programs suggest that they are effective, but controlled experiments provide more rigorous tests of their benefits (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Delmas, Fischlein, & Asensio, 2013; Gray & Bean, 2011; Kirby et al., 2005). Given this circumstance, we

conducted a controlled field experiment to evaluate a social marketing–enhanced home energy education program implemented through a home energy performance company. The experiment involved having an energy educator (EE) conduct in-home energy education visits. In this article, we describe the program and present the study findings. The results distinguish between behaviors that are more likely and less likely to be influenced by such an EE home visit.

Social Psychology Tools for Home Energy Education

Social marketing research supports combining several theoretically and empirically based strategies to enhance energy conservation behavior (McKenzie-Mohr & Smith, 1999).

We drew on a suite of research-based tools and techniques to enhance the likelihood that homeowners would adopt certain significant energy-saving behaviors and upgrades. In addition to having our EE discuss financial incentives for performing renovations and installing energy-efficient appliances, we incorporated several social marketing and psychological concepts into the program to potentially strengthen its effectiveness:

- *Cultivating relationships.* Feelings of liking and a strong rapport with a communicator are predictors of compliance with the communicator's requests (Cialdini & Sagarin, 2005). A core component of our EE home visit was emphasis on building a strong relationship between the EE and the homeowner.

- *Modeling the desired behavior.* Clear and vivid modeling goes a long way toward overcoming the hurdle of inaction, enhancing intention and follow-through on conservation behaviors (Heimlich & Ardoin, 2008). Our EE modeled specific behaviors and provided well-illustrated information to make energy conservation changes easy to implement.

- *Creating customized action plans.* One-size-fits-all plans for reducing barriers to adoption of desired behaviors are of limited value (Heimlich & Ardoin, 2008). Educators need to be flexible, identifying and addressing specific barriers and needs that arise on an individual case-by-case basis. Our EE worked with customers to develop Energy Action Plans customized to their specific needs and interests.

- *Encouraging signed commitments.* One simple but effective way to enhance follow-through on planned actions is to ask people to make written commitments to undertake specific behavior(s) (Baca-Motes, Brown, Gneezy, Keenan, & Nelson, 2013; Werner et al., 1995). Our EE asked homeowners to sign their customized Energy Action Plans to encourage their commitment.

- *Applying social norming.* Homeowners are motivated to save energy when they receive feedback about how their energy use compares to that of their neighbors, especially when that feedback is combined with a message that communicates social approval for energy savings (Farrow, Grolleau, & Ibanez, 2017; Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). Our EE showed homeowners how their energy use compared to that of others living in similar homes. Additionally, the EE used a map to show homeowners all the other people in their area who had signed actions plans to conserve energy.

Purpose and Objectives

We examined the effectiveness of a pre-energy-audit EE visit implemented through a home energy performance company for enhancing homeowner adoption of energy conservation behaviors. We tested the

following hypotheses:

Hypothesis I. Homeowners who receive the EE home visit will report taking up more no-cost and low-cost energy-conservation changes than homeowners who do not receive the home visit.

Hypothesis II. Homeowners who receive the EE home visit will report engaging in more energy-saving habits than homeowners who do not receive the home visit.

Hypothesis III. Homeowners who receive the EE home visit will be more likely to invest in home energy retrofits than homeowners who do not receive the home visit.

Method

Participants and Design

Participants were homeowners within 30 mi of Ithaca, New York, who contacted the home energy performance company to request a comprehensive home energy audit. When prospective customers called, they were assigned to either the experimental or the control condition, in an alternating (every other one) sequence. There were 85 participants in each condition. Prospective customers were excluded from the study if they had a prior relationship with the company as a customer, relative, or friend or if they already had received a home energy audit.

Procedure and Materials

Overview

Participants in the experimental condition received an EE visit prior to a home energy audit. Participants in the control condition received only a home energy audit, performed by a building analyst. At the end of the EE visit, participants in the experimental condition completed a plan about home energy actions they would take. From 6 to 8 months after the home energy audit, participants in both conditions received a follow-up questionnaire assessing their home energy actions.

EE Visit

The EE visit was conducted in the customer's home and followed a strict script and sequence, as outlined below. Relevant social marketing and psychology concepts are indicated.

1. The EE shared the Energy Star Home Energy Yardstick, a comparison of the individual's home energy use to average and efficient household energy use for comparable homes in New York State (see https://www.energystar.gov/) (applying social norming).

2. The EE collected basic building measurements, surveyed baseload energy use, and took pictures. (In the control condition, the building analyst completed these steps.)

3. The EE provided customized recommendations from a checklist of possible no-cost and low-cost one-time

steps to reduce baseload energy use in four key areas: lighting, appliances, electronics, and hot water (creating customized action plans). These recommendations were presented as an Energy Action Plan that homeowners were asked to sign to solidify their commitment to completing the actions they checked (encouraging signed commitments).

4. When discussing the Energy Action Plan, the EE used sample products, pictures, and activities to demonstrate the implementation process (modeling the desired behavior). The EE also showed the homeowner a chart of the most popular actions of other customers (applying social norming).

5. Homeowners who completed and signed an Energy Action Plan (virtually every participant) were added (as data points) on a map of the area, demonstrating that they were joining a larger community-wide movement to make energy-saving changes in the home (applying social norming).

6. The EE gave the Energy Action Plan to the homeowner with a magnet stating "I'm one of the homeowners who is taking actions that make this a [sustainable] planet!" and suggested that the Energy Action Plan be placed on the refrigerator as a reminder (encouraging signed commitments).

7. The EE provided a list of resources for sourcing energy-saving products associated with the action items and provided information about available grants, loans, and rebates for relevant home retrofit work.

8. One month later, the EE conducted a structured follow-up phone call to check on homeowner progress and encourage action (cultivating relationships, encouraging signed commitments).

Results

Planned Energy Actions

As shown in Table 1, participants in the experimental (EE) condition committed to taking many energy-saving actions. Over 70% planned to adjust refrigerator and freezer settings, clean refrigerator and freezer coils, install LED bulbs, insulate hot water supply pipes, and have dryer ducts professionally cleaned. Actions that many customers said they were already doing included line-drying clothes (48%), turning off lights when not in use (86%), and using cold water for laundry when possible (58%).

Table 1.

Energy-Saving Actions Planned by Experimental Group Participants at Time of Energy Educator Visit

Energy-saving action	Already doing %	Plan to do %	Not interested %
No-cost and low-cost one-time changes			
Check and adjust refrigerator and freezer temperatures	6	93	1
Clean and/or service refrigerator/freezer coils	9	89	1
Install energy-efficient, long-lasting LED bulbs	22	77	1

Install low-flow, efficient showerhead(s)	58	31	12
Install motion sensors to turn lights off automatically	4	12	85
Insulate hot water supply pipes	15	77	8
Lower water heater temperature	45	45	11
Have dryer ducts professionally cleaned	9	85	6
Replace one or more old, inefficient appliances	34	38	28
Energy use habits			
Line-dry clothes when possible	48	11	41
Turn off lights when not in use	86	13	1
Turn off power strips when not in use	9	41	50
Use cold water for laundry when possible	58	42	0

Note. n = 85. Percentages in rows may not sum to 100 due to rounding.

No-Cost and Low-Cost One-Time Changes

At 6 to 8 months after the energy audit, participants in the experimental (EE) condition reported having made significantly more no-cost and low-cost one-time changes to save energy in their homes compared to participants in the control (audit only) condition (Table 2). Chi-square analyses revealed significant differences in their checking and adjusting refrigerator and freezer settings, cleaning refrigerator and freezer coils, lowering water heater temperature, and having dryer ducts professionally cleaned. Notably, there was no significant difference between the groups for LED light installation. Most customers in both groups took this no-cost/low-cost one-time action, which was recommended by both the EE and the auditor. Altogether, these findings provide support for Hypothesis 1. Homeowners who received the EE home visit reported taking up more no-cost/low-cost one-time energy-conservation changes than homeowners who did not receive the home visit.

Table 2.

Steps Participants Had Taken to Save Energy in Their Homes 6–8 Months After Energy Educator (EE) Visit or Audit

No-cost or low-cost one-time change	**Percentage of EE group (*n* = 53)**	**Percentage of audit-only group (*n* = 54)**	χ^2	*p*
Checked and adjusted refrigerator and freezer temperatures	70	19	21.437	.000*
Cleaned refrigerator/freezer coils	26	11	13.114	.000**
Installed energy efficient, long-lasting LED bulbs	81	63	1.923	.166
Installed low-flow, efficient showerhead(s)	17	15	0.065	.798
Installed motion sensors to turn lights off automatically	4	9	1.341	.247

Insulated hot water supply pipes	15	13	0.073	.787
Lowered water heater temperature	43	19	6.355	.012*
Had dryer ducts professionally cleaned	30	9	6.574	.010*
Replaced one or more old, inefficient appliances	28	26	0.042	.838

** p < .05. ** p < .01. *** p < .001.*

Energy Use Habits

To assess energy use habits, in the 6-month follow-up survey, we asked customers to rate themselves on a variety of everyday behaviors, such as line-drying clothes and turning off lights when not in use. For each behavior, customers responded on a 5-point Likert scale to the question "In the past month, how often have you done the following to save energy in your home?" As shown in Table 3, results from independent-samples *t*-tests revealed no significant differences between the two treatment groups in their reporting of these ongoing energy use habits, suggesting that the EE visit did not have an impact on these behaviors. These findings do not provide support for Hypothesis II.

Table 3.

Comparison of Participants' Home Energy Use Habits During Preceding Month at Time of Follow-up Survey

	Experimental (*n* = 50)		**Control (*n* = 51)**			
Energy use habit	***M***	***SD***	***M***	***SD***	***t***	***p***
Line-dry clothes when possible	2.33	.887	2.10	.918	-1.281	.203
Turn off lights when not in use	3.47	.542	3.46	.646	-.089	.929
Turn off power strips when not in use	1.92	.877	1.67	.864	-1.462	.147
Use cold water for laundry when possible	3.16	.817	3.16	.925	-.018	.986

Note. df = 98. Scale: 1 = *never*, 2 = *sometimes*, 3 = *usually*, 4 = *always*.

Home Energy Renovation

Overall, 28% of customers followed through with the recommended home energy renovation work. A chi-square analysis revealed no significant differences between the experimental and control conditions regarding the decision to implement renovation work, χ^2 (2, N = 85) = 0.464; $p > .05$. These data do not provide support for Hypothesis III.

Benefits of EE Visit

In the follow-up survey, customers were asked to identify elements of the EE visit that they found particularly helpful as well as those that were not useful. Table 4 summarizes results of these questions. Respondents

indicated that most of the activities of the EE visit were helpful. The most popular activity of the visit was identification of no-cost/low-cost action steps to reduce energy use. The attitude reflected by this circumstance is in line with our finding that the only significant effect of the EE visit was increased adoption of no-cost/low-cost one-time actions.

Table 4.

Customer Perceptions of Helpfulness of Energy Educator (EE) Visit Components

Visit component	**Percentage of EE group (*n* = 53)**
Is there anything you found particularly helpful from the energy educator visit?	
Discussing your goals for the house	66
Identifying no-cost/low-cost action steps to reduce energy use	76
Discussing what to expect from the home energy audit	59
Completing the Energy Action Plan	41
Discussing New York incentives (grants, rebates, loans) for energy-saving home improvements	47
Were there any aspects of the energy educator visit that weren't useful to you?	
Discussing your goals for the house	2
Identifying no-cost/low-cost action steps to reduce energy use	4
Discussing what to expect from the home energy audit	4
Completing the Energy Action Plan	11
Discussing incentives (grants, rebates, loans) for energy-saving home improvements	11

Discussion, Conclusion, and Recommendations

Our findings point to the value of an EE home visit for influencing the adoption of no-cost/low-cost energy-saving actions in the home. However, our EE program did not prove effective for changing long-standing energy use habits or encouraging homeowners to invest in expensive home energy renovations.

The fact that homeowners' energy use habits did not change is not surprising given the literature on personal habit changes, which suggests that structural changes to the environment are necessary for changing ingrained habits (Neal, Wood, & Quinn, 2006). Moreover, Verplanken and Roy (2016) found that recently relocated homeowners are most susceptible to changing habits within the first 3 months after the move. Perhaps some Extension programs could bring energy education to new homeowners and renters as a way of addressing ingrained energy use habits.

When it comes to taking on home retrofit measures, homeowners cite time, money, and lack of information as primary barriers to following through with recommended work (Kirby, Guin, Langham, & Chilcote, 2014). With the home visits in our study, homeowners in both the treatment group and the control group had access

to financial incentives and the expertise of a home retrofit contractor. We predicted that the rapport fostered by the EE visit would further motivate the adoption of home retrofit work. Our results do not support this hypothesis. In fact, it is possible that the EE visit, which added a second appointment (and, hence, more time commitment) to the homeowner's schedule, might have served as a barrier to the adoption of the auditor's recommended retrofit work. To this point, there was a trend of more homeowners in the audit-only condition taking up the recommended work compared to those in the EE condition (though not statistically significant).

Another possible unintended negative effect of the EE visit is single-action bias, which can occur when a person's initial one-time behavior relieves them of further concern or need for action (Weber, 1997). Since homeowners who received the EE visit were more likely to make no-cost/low-cost one-time changes, they might have felt sufficiently "energy-efficient" and therefore less inclined to make more costly energy-saving investments.

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The complete energy educator script, list of typical home audit steps, methodology file describing all questionnaire items, data files (in .dat and .sav format), codebook for the data files, and final report of grant-funded activities to NYSERDA are publicly available at https://osf.io/tczhd/.

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