Social Marketing as a Means to Influence Student Behavior Towards Energy Conservation

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By Sarah Ball

Global warming has become a "hot topic" over the past few years, entering into politics, the media, and classrooms around the world. Many people have seen Al Gore's documentary, "An Inconvenient Truth," which shows that the melting of the Greenland ice sheet could shut down the thermohaline circulation in the Atlantic Ocean, effectively causing an ice age in Europe while the rest of the planet continues to get hotter. Not only would the onset of an ice age destroy much of the plant and animal life, it would also cause an economic loss of over 40% of Europe's GDP (Cline, 2004). Greenhouse gases, particularly carbon dioxide, are believed to be the main cause of global warming. Burning natural gas, fuel oil, coal, and propane, as well as using electricity, account for 21% of total carbon dioxide emissions.

There have been and still are many attempts to dampen the effects of carbon dioxide emissions, such as the gas-guzzler tax and tax credits for conservation. The gas-guzzler tax applies to the sales of vehicles with official EPA-estimated gas mileage below 22.5 miles per gallon based on a 55%/45% highway/city usage. However, this tax was only applied to cars weighing less than 6,000 pounds which lead to the increased popularity in SUVs and other large passenger cars (Excise Tax for 2007). Another example is the use of tax credits for private residents who use alternate sources of energy (solar, wind, geothermal), to help cover the costs of equipment and installation.

Despite these two examples and other government efforts to reduce carbon dioxide emissions, global warming is still a major concern. In recent years, this problem has resonated with university students across America. Most students realize they should conserve energy to reduce emissions, yet few actually do so on a regular basis. Simple actions such as taking shorter showers, turning off computers at night, and recycling used water bottles are virtually effortless and can notably reduce a campus's energy consumption. However, as simple as these steps are, there is a disconnect between student awareness and student action.

I. Literature Review

Research suggests that the disconnect between awareness and action can be due to automatic behaviors. The idea behind this "nonconscious processing" is that repeated conscious experiences, such as walking or tying shoelaces, become nonconscious (automatic) over time (Bargh and Chartrand, 1999). The benefit of automatic behavior is that people are "able to engage in choices and behaviors without expending [their] limited reserves of conscious effort" (Sharp et al, 2004). The downside, however, is that, without realizing it, most students have developed many automatic behaviors that are detrimental to the environment, such as throwing away recyclables, leaving computers and printers on through the night, and not turning off lights when leaving a room.

Nonconscious behaviors that are detrimental to the environment must be replaced with new environmentally friendly nonconscious behaviors if we are to reduce carbon emissions. According to Sharp et al. (2004), the major obstacle confronting the behavioral change is that it must be quick and easy to learn the new behaviors or the students will lose interest. Information drawn from the Harvard Green Campus Initiative (HGCI), implemented in 2000, suggests "that people are most effectively catalyzed to adopt new behaviors if they are being encouraged to do so by peers, if there are well designed and well placed triggers to remind them… and if they are able to internalize a permanent sense of the hidden impacts of their behavior" (Sharp et al, 2004). Essentially, "changing habits requires information, commitment, encouragement, and feedback" (Creighton, 1998).

A psychological approach to this problem is "social marketing," which attempts to incite active consideration of behavioral alternatives through education and information-based strategies (Cornelissen, Dewitte, Warlop, and Yzerbyt, 2007). However, the assumption is that people are rational and self-interested; therefore, they will naturally balance the private and public costs and benefits of any potential undertaking. Most people's environmental choice calculi include current private costs and future public benefits, leading individuals to choose non-environmentally friendly behaviors (Cornelissen, Dewitte, Warlop, and Yzerbyt, 2007). An example of a private cost is taking the time to remove bottle caps from plastic bottles before recycling because many recycling companies will just throw out any plastic bottles with the caps still on. The corresponding future public benefit is a decrease in landfill volumes because the plastic bottles are then recycled. However, the benefit is experienced by future society and the cost is wholly borne by the individual who recycles. People acting on rational self-interest alone are unlikely to recycle. Social marketing attempts to change that dynamic by providing information that links the costs to the benefits.

Two other methods for replacing detrimental behaviors with environmentally friendly ones are "social labeling" and "re-attributing previous behavior." Social labeling is "a persuasion technique that consists of providing a person with a statement about his or her personality or values in an attempt to provoke behavior that is consistent with the label" (Cornelissen, Dewitte, Warlop, and Yzerbyt, 2007). An example is shown by Miller, Brickman and Bolen (1975): asking a group of fifth graders to be tidy has little effect, whereas describing them as tidy was more affective in keeping a classroom clean. Re-attributing previous behavior is most easily illustrated through example: people choose to take public transportation for numerous non-ecological reasons (it is cheaper, more convenient, etc.); however, if you put a sign on the bus labeling the passengers as "responsible, environmentally friendly citizens," they might perceive their choice as environmentally friendly instead of economically rational and, therefore, become more concerned with the environment. Basically, re-attributing previous behaviors is causing consumers to identify spontaneously pro-environment behaviors done for non-ecological reasons as being done for ecological reasons (Cornelissen, Dewitte, Warlop, and Yzerbyt, 2007).

The goal of all three methods is to change behavioral patterns; however, the key difference is that social marketing does so through education about a desired behavior, social labeling does so by identifying a group as possessing the desired behavior in the hope that they fulfill that label, and re-attributing previous behavior does so by changing a person's perception about their activities to lead them to identify themselves as possessing the desired behavior.

One major obstacle to these approaches is psychological, as well. For example, consumers who are aware of social labeling might feel manipulated and, therefore, not perform the desired action (e.g. recycling, turning off the lights). The assumption to get around this obstacle is that people have scarce conscious effort under normal circumstances and do not have the capability to process the truthfulness of the social label, so they will accept it as truth (Cornelissen, Dewitte, Warlop, and Yzerbyt, 2007).

Although many solutions to bridging this disconnect between awareness and action have been put forth, there has been very little, if any, empirical investigation into the matter. The purpose of this paper is to fill in this literature gap by empirically assessing the question: Has

NORESCO's social marketing been an effective approach at influencing Mary Washington student behavior towards energy conservation?

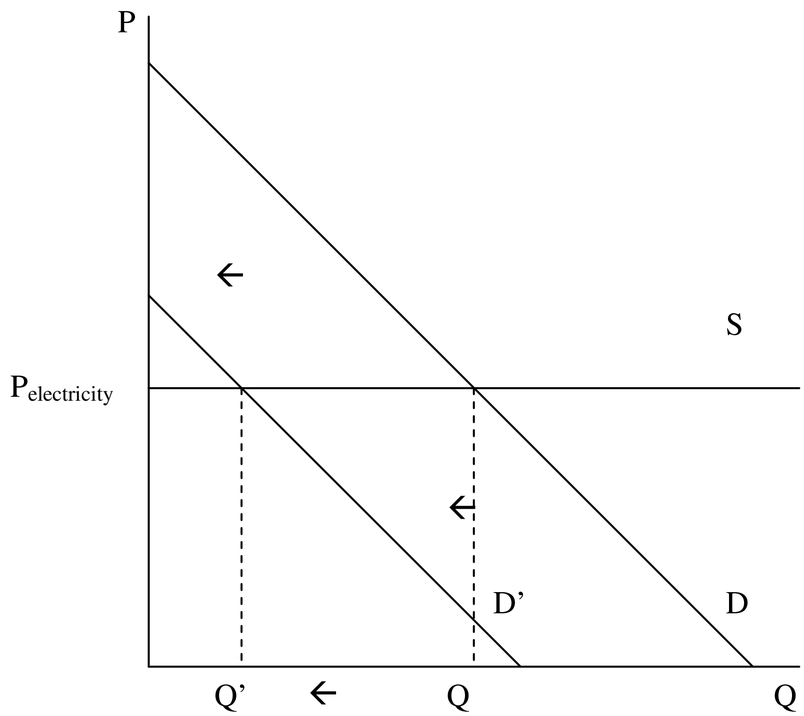
II. NORESCO

NORESCO, one of the largest energy saving companies in the United States, partnered with the University of Mary Washington to help reduce the university's energy usage, its "environmental footprint." In 2005, NORESCO began retrofitting buildings, such as Seacobeck, and in 2007, it initiated its Behavior Change Program. The Behavioral Change Program is an attempt to increase student awareness of energy conservation techniques through social marketing. As example components of this approach, a presentation was given to the Resident Assistants and surveys were administered throughout the dorms. The surveys were used to distribute information in the form of a question; for example, "Did you know that screen savers use more energy, not save it?" A follow up survey was distributed later in the year to track student changes as indices to the effectiveness of the program. As one example, of students surveyed, 60% had their computers set to sleep/hibernate after a short period of activity pre-program which increased to 71% post-program.

III. Energy Consumption Model

The theoretical basis of this analysis is a classic supply and demand model of electricity consumption, where supply is assumed to be perfectly elastic (Figure 1). Essentially, this means that, at any cost, electricity will be supplied to meet student demand. If student behavior towards energy conservation has been influenced, the demand curve for energy will shift inwards from D to D'. Therefore, the quantity of energy consumed will decrease from Q to Q'.

Figure 1 – Energy Consumption Model



Based on this model, an ideal data set would include electricity consumption per resident as the dependent variable and the following as independent variables: number of residential buildings, number of residential buildings with central air conditioning, average monthly temperature, number of blackouts per month, average hours of daylight per month, and a dummy variable to represent a social marketing program. An increase in all but the number of blackouts is associated with an increase in energy consumption per resident and an outward shifting of the demand curve. An increase in the number of blackouts is associated with a decrease in energy consumption and an inward shifting of the demand curve. However, data on the number of blackouts per month and average hours of daylight per month were unavailable, and the number of residential buildings and residential buildings with central air conditioning does not change over the chosen time interval.

Econometrically, ordinary least squares regression analysis will be applied to two sets of time series data, the only difference between the two being the dependent variable – electricity consumption (kWh) per traditional housing resident or electricity consumption per apartment resident. The equation is as follows:

$$\gamma = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon$$

where x_1 is the number of heating degrees, x_2 is the number of cooling degrees, and x_3 is a dummy variable to measure the impact of NORESCO's Behavioral Change Program (to be discussed in the next section) (0 = pre-program, 1 = post-program). Therefore, the equation can be written as:

$$\text{electricity consumption per resident (traditional or apartment)} = \alpha + \beta_1(\text{heating degree}) + \beta_2(\text{cooling degree}) + \beta_3(\text{dummy}) + \varepsilon$$

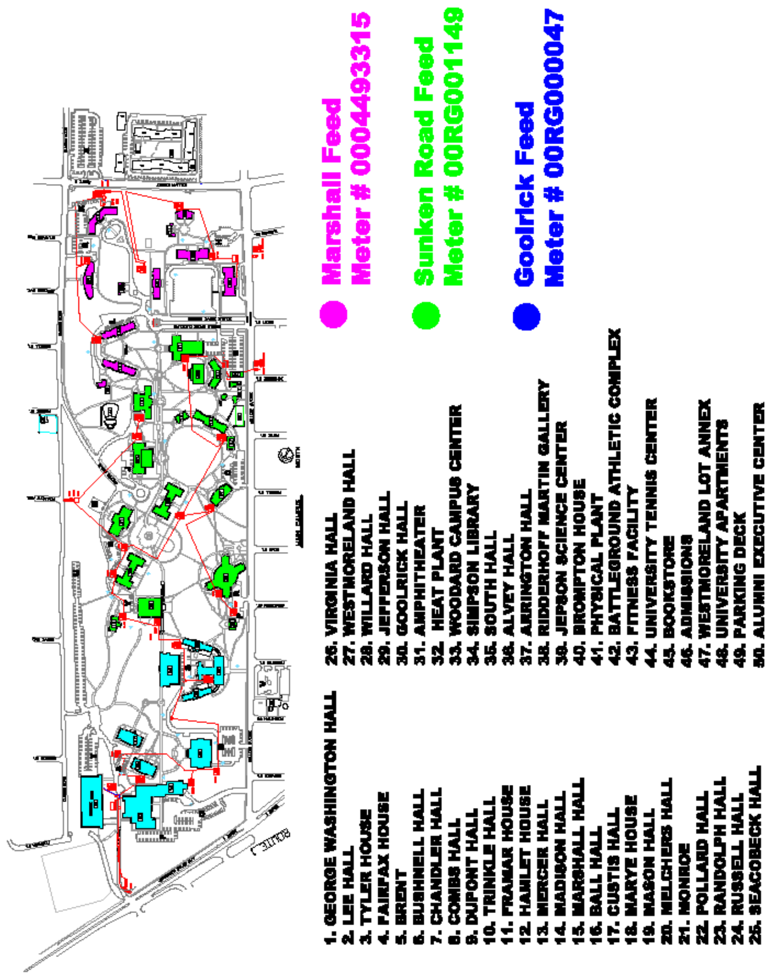
A heating or cooling degree is a unit used to relate the day's temperature to the energy demands of heating and air conditioning. The number of heating or cooling degrees in a day is defined as the difference between a reference temperature of 65°F (18°C) and the average outside temperature for that day. The value of 65°F is used because experience shows that if this is the outside temperature then neither heating nor cooling is typically required. For example, if a day’s average temperature were 80°F, there would be 15 cooling degrees and if the day’s average temperature were 30°F, there would be 35 heating degrees. The reasoning behind using heating and cooling degrees over average monthly temperature is that relatively hot and cold days are not recorded with average monthly temperatures, yet heating and cooling degrees take those days into account.

IV. Data

Electrical usage data is only available per semester since 2004 when formal compilation began. Since then, traditional housing electricity usage has been recorded by three different feeds: Marshall Feed, Sunken Road Feed, and Goolrick Feed (Figure 2). Unfortunately, the granularity of the data makes it impossible to differentiate between electricity consumption of residential and academic buildings. However, it is assumed that the behaviors the residents learn to apply in residential buildings will carry over to their behavior in academic buildings; for example, post-program students will be more likely to turn the lights off in a room if they are the last to leave.

Apartment electricity has been recorded separately, on a per apartment basis, since the apartments opened in 2004. The electrical usage data was provided by the Director of Utilities/Energy and the Utilities and Contract Support Technician.

Figure 2 – Electricity Usage by Feed



Historical heating and cooling degrees statistics for Fredericksburg were obtained online from the Weather Underground.

V. Regression Analysis

Two regression analyses were conducted – one with the electricity per traditional housing resident and one with electricity per apartment resident as the dependent variables (Table 1). According to the results for traditional housing, all variables were of varying significance. Furthermore, the high R^2 value of 0.71 suggests that this equation explains the variations relatively well. The variable of focus is the dummy variable, which measures NORESCO's social marketing approach's influence on student energy consuming behavior. It is significant at the 90% confidence interval and has a large co-efficient of -47.08. Effectively, this means that, ceteris paribus, the Behavioral Change Program had decreased electricity use per resident by 47.08 kWh. As expected, both heating and cooling degrees affect the amount of electricity used; however, what is unexpected is that heating degrees are negatively related to electricity consumption. As the temperature decreases, the number of heating degrees increases, and the amount of electricity use per resident decreases. A possible explanation for this could be that 95% of the buildings on campus use steam to water converters to heat the buildings and that the steam comes from the Heating Plant, which runs off natural gas. Therefore, the heating degrees do not have a direct effect on electricity consumption. However, indirectly, they do, since when it gets cold enough, electricity consumption is replaced with gas consumption.

Table 1 – Regression Analysis

	1	2
Heating Degrees	-0.15**	0.03
	(-3.83)	(0.42)
Cooling Degrees	0.25**	0.33**
	(2.97)	(2.26)
Dummy (NORESCO)	-47.08*	-21.21
	(-1.90)	(-0.51)
N	35	31
R^2	0.71	0.21

Note: t-statistics in parentheses
* – 90% confidence interval
** – 95% confidence interval

According to the results for the apartments, the only significant variable was cooling degrees. The R^2 value was also relatively low at 0.21. Therefore, NORESCO's program had an insignificant influence on the apartment residents' electricity consumption. One possible explanation for this could be that there is very little RA to resident interaction in the apartments and, since the major proponent of the program was for RAs to educate their residents about energy conservation, this gap in information seems to have kept the residents from changing their behavior. Another possible explanation could be that the residents have access to more appliances using electricity. Every apartment comes with a working kitchen for which additional electricity is consumed. There are also more overhead lights and, since the apartment is divided into rooms, generally more televisions and additional lamps than in traditional housing.

VI. Conclusion

NORESCO's Behavioral Change Program was effective at reducing the electricity consumption of traditional housing residents. Electricity consumption per resident has significantly been reduced since the program's implementation in 2007. However, the apartment residents have been unaffected, possibly due to lack in RA-resident interaction or the increased opportunities to use electricity in the apartments. As the years go on and the program becomes more integrated into traditional housing, electricity consumed per resident may decline as the program increases participation rates and is modified to increase buy-in. However, in the case of the apartments, it might be worthwhile to create a program tailored specifically towards that group. A useful direction for further research would be to include gas consumption and water consumption into the analysis since those were other energy reduction areas targeted by the program. It would also be interesting to do a follow up in a few years to see if consumption continues to decrease, levels off, or returns to higher baseline levels.

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