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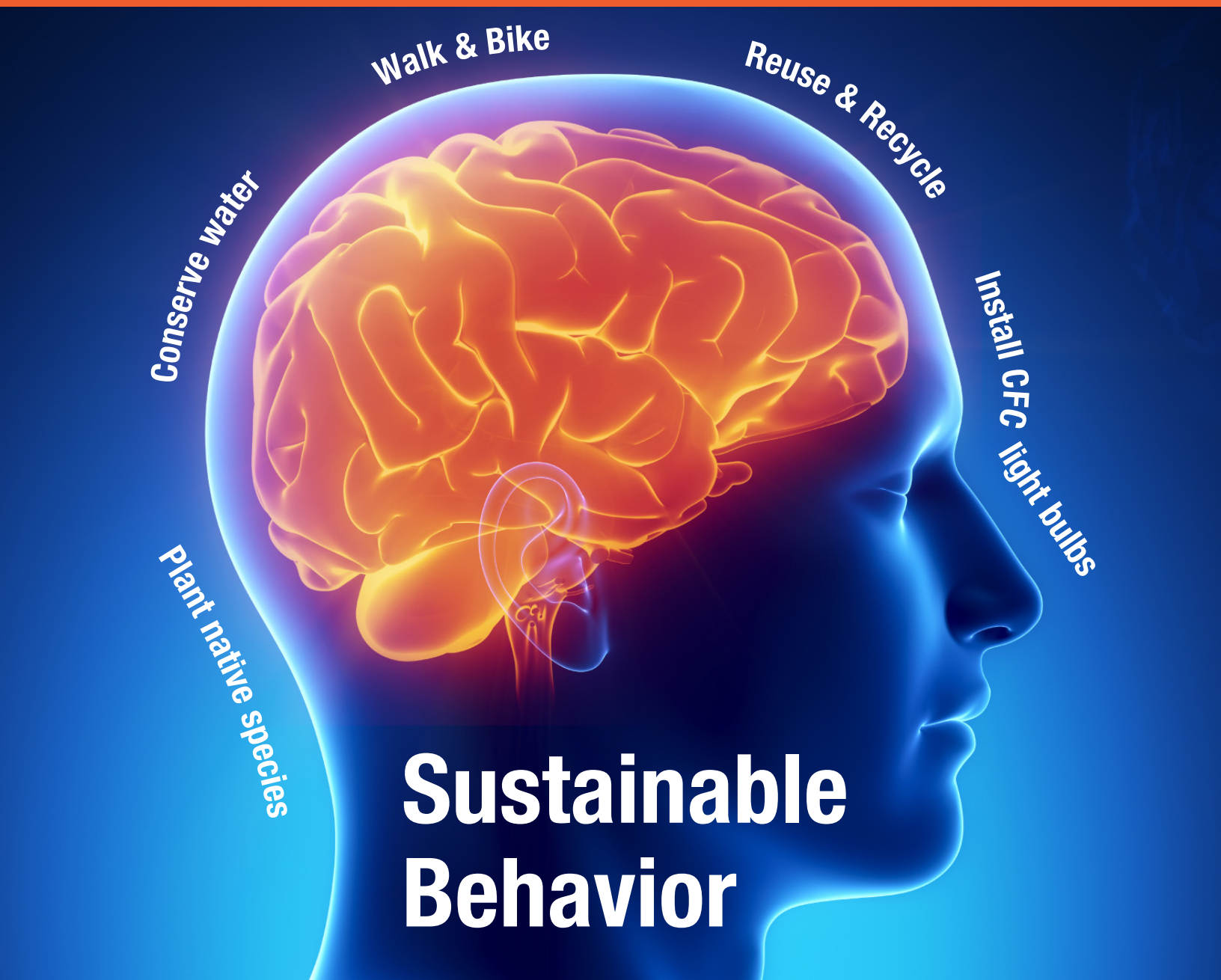

Sustainable Behavior

sustain

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The Kentucky Institute for the Environment and Sustainable Development (KIESD) was created in July 1992 within the Office of the Vice President for Research, University of Louisville.

The Institute provides a forum to conduct interdisciplinary research, applied scholarly analysis, public service and educational outreach on environmental and sustainable development issues at the local, state, national and international levels.

KIESD is comprised of eight thematic program centers: Environmental Education, Environmental Science, Land Use and Environmental Responsibility, Sustainable Urban Neighborhoods, Pollution Prevention, Environmental and Occupational Health Sciences, Environmental Policy and Management, and Environmental Engineering.

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Sustainable Behavior

The articles in this issue of *Sustain* were originally presented at two conferences on behavioral change and sustainability in 2012. The first conference, "Behavior Change for a Sustainable World Conference," was held August 3-5, 2012 at The Ohio State University in Columbus, Ohio. The conference was organized by the Association for Behavior Analysis International® (ABAI) focusing on how basic principles of behavior change can help in the fight to preserve our environment. For more information about ABAI and future conferences see http://www.abainternational.org

The second conference was the 6th annual "Behavior, Energy & Climate Change Conference" co-sponsored by the Precourt Energy Efficiency Center (Stanford University), American Council for an Energy-Efficient Economy, and the California Institute for Energy and Environment (University of California). The BECC, attended by 700 at its 2012 conference, focuses on understanding individual and organizational behavior and decision-making related to energy usage, greenhouse gas emissions, climate change, and sustainability. The 2012 conference was held in Sacramento, California, November 12-14. This year's conference is scheduled November 18-20, 2013 also in Sacramento. For more information about the BECC conference see http://beccconference.org/

Russell Barnett, Director

Kentucky Institute for the Environment
and Sustainable Development

Sustaining Sustainability with Clueless Contingencies

By William L. Heward and Jonathan W. Kimball

An annual Energy-Saving Dorm Competition is one component of Bowdoin College's sustainability effort. The month-long contest at the Maine campus features an online dashboard that provides real-time feedback on energy use and virtual trophies for bragging rights. Residents of Baxter House, winners of the top spot in 2011 for reducing their energy use by a whopping 39.7%, declared their dorm an "Eco-palace"... but asked: "Are these practices sustainable? How can we incorporate this month-long competition into our everyday life?"[1]

Climate change is no longer a future condition predicted by computer models. 2012 was the warmest year on record. While the Earth's ice sheets melted and oceans rose at historic rates, representatives of 200 nations at the UN conference on climate change learned that the Intergovernmental Panel on Climate Change's (IPCC) dire predictions had underestimated the magnitude, pace and impact of global warming (Scherer, 2012).

Even the most ardent doubters have given up the claim that this warming is a function of naturally occurring fluctuations. In a New York Times op-ed essay last summer, long-standing critic of prevailing climate science, University of California, Berkeley physics professor Richard Muller (2012), stated "Last year, following an intensive research effort involving a dozen scientists, I concluded that global warming was real and that the prior estimates of the rate of warming were correct. I'm now going a step further: Humans are almost entirely the cause."[2]

For many climate scientists, the biggest challenge of global warming has shifted from proving that it is real to getting people to change their behavior in response to it (e.g., Thompson, 2010; Werner, 2012).

> We can build a sustainable future with environmentally friendly fuels, clean air and water, and with economic development and good jobs. The question is whether we will move in this direction at a fast enough pace to avoid disaster. . . We don't know how much time we have to get the job done. Nature is the timekeeper, and none of us can see the clock. But we do know the clock is ticking. (Thompson, 2013, pp. 10, 11)

Even if all fossil fuel emissions ceased today, our climate would continue warming for decades (Marcott, Shakun, Clark, & Mix, 2013). Successfully adapting to that reality will require massive changes in energy sources and use, transportation infrastructure, food production, environmental protection, population control, and economic practices on a global scale far beyond the scale of behavior changes we can make now. But the changes we do make now can provide a *behavioral wedge* that gives society time to discover the technological fixes and implement the policy changes necessary to make carbon neutrality and truly sustainable society realities (Dietz et al., 2009).

The question is not whether we need to change our ways, but how?

Knowing Is Not Enough

The conventional wisdom—and an idea at the core of many psychological theories—is that behavior is the result of thoughts and feelings, and that to change our behavior we must first change the way we think and feel. If we want people to act green,

Figure 1. The effects of global warming are already causing suffering to many. The glaciers that provide water for people, animals and plants in this Quechua girl's community have melted so much that streams have changed course causing Alpaca pastures to dry up in some valleys and flood in immediately adjacent valleys. Unstable lakes have formed in valleys that were glacier filled only two decades ago, exposing homes down valley to new geologic hazards.

Photograph by Lonnie G. Thompson. The Ohio State University

we have to convince them that climate change is real and that acting green will help them and the planet. It sounds good, but efforts to change behavior by changing minds yield disappointing results. Numerous studies spanning three decades document that information campaigns aimed at fostering sustainable behavior have little, if any, effect (e.g., Abrahamse, Steg, Vlek, & Rothengatter, 2005; Geller, Erickson, & Buttram, 1983; Schultz, 2002).

The problem: knowing and doing are two different kinds of behavior, and they are not necessarily connected. People *know* that they shouldn't smoke, but they *do*; they *know* they should live within their means, but they *don't*; they *know* they shouldn't text while driving but they *do*. The same holds for environmentally sustainable practices.[3] We *know* riding public transportation to work will reduce fossil fuel emissions, but we *don't*; we *know* taking our groceries home in a reusable bag will help keep plastic out of landfills, but we *don't*, we *know* recycling the ink cartridges from our printer will require fewer raw materials and less energy to replace them, but we *don't*. Why is that?

It's a Matter of Consequences

> Every day our actions have consequences, large and small. A completed chore, a smile, a promotion. Consequences motivate: Newborns work to hear their mothers' voices. Toddlers graduate to turning lights on and off for that lovely, surprising feeling of control. A kaleidoscope of consequences awaits. (Schneider, 2012, p. 13).

While Charles Darwin postulated that the characteristics of a species are selected by contingencies of survival that operate over the course of many generations, B. F. Skinner claimed that many characteristics of behavior are selected by contingencies of reinforcement that operate over the course of an individual's lifetime. "Skinner explained variability in behavior within and among individuals as at least partly the result of particular responses becoming more (or less) likely as they affect functional…changes in their immediate physical or social environment. Responses…are selected for or against by the consequences they produce" (Kimball, 2002, p. 71).

Skinner's recognition and experimental demonstration of selection by consequences—a process replicated in hundreds of laboratory and field experiments across species, settings, and behaviors, and the bedrock on which all other behavioral principles are based—was revolutionary, and can help us understand why information campaigns often produce limited returns: people often act their way into thinking, rather than think their way into acting.

The consequences of our actions are primary determinates of whether we repeat them. We repeat behaviors that result in positive consequences (less work or effort, praise and recognition, money, fun, escape from or avoidance of harm or unpleasantness) and refrain from repeating behaviors with a history of negative consequences (loss of money, scorn, pain, extra time and effort). It is fair to ask what could possibly be a more powerful consequence than a planet rendered uninhabitable by our actions, but in the context of daily life, catastrophe is more abstract idea than concrete fact; destruction of our environment by today's behavior is a remote possibility, and we humans evolved to be most sensitive to immediate consequences. As Skinner (1987) wrote, "We cannot know the future by acquaintance…and have very little reason to act [if] we know it by description. The more remote the predicted consequences, the less likely we are to follow advice" (p. 5).

The branch of the science Skinner founded, called applied behavior analysis (or ABA) is concerned with developing a research-based technology for changing human behavior (Cooper,

Heron, & Heward, 2007). ABA's focus is socially significant behavior change, acts that improve the quality of people's lives. While best known for developing the most successful treatments of autism and other developmental disorders, ABA's focus on selection by consequences has led to important contributions to education, addiction treatment, healthcare, industrial and highway safety, and green behavior change (e.g., the Smart Meters now used to reduce energy use were derived from behavioral research done in the 70s).[4]

One subfield of behavior analysis, known as organizational behavior management, developed something known as PIC-NIC analysis as a pragmatic way to analyze behavioral consequences along three dimensions: valence (Positive/Negative), temporal proximity (Immediate/Future), and probability (Certain/Uncertain) (Daniels, 2000). While this taxonomy was developed for use in the workplace, it has much broader applicability, including the endeavor to understand why people make, or fail to make, green choices.

People are most likely to engage in behavior that leads to immediate and certain consequences: if these consequences are positive (PICs), people will act to secure them; if negative (NICs), they will act to avoid them. In other words, PICs and NICs are powerful consequences because the behaviors that led to them are highly likely. As their temporal proximity and likelihood fade, both positive and negative consequences lose potency relative to other consequences that may also be available. Unfortunately, the consequences for undesirable behavior are often more powerful than those for a desirable alternative.

Lattal (2012) described how a PIC-NIC analysis sheds light on why many sanitation workers in Atlanta dumped recyclables into the receptacles designated for trash. Throwing recyclables away with the trash saved the workers time and effort: positive, immediate, and certain consequences. Proper sorting led to negative, immediate and certain consequences of extra effort and more time to complete the route; thus it was a behavior to be avoided. When the practice came to light, administrators said they would fire anyone caught doing it, but the threat had no effect on workers' behavior: while getting fired for sloppy work is a negative consequence, it is neither immediate nor certain, and therefore a weak consequence less likely to be avoided than the immediately onerous task of sorting recyclables from refuse.

Figure 2 illustrates how PIC-NIC analysis may be used to compare the relative value of some consequences that might bear on the all too common dilemma confronted by typical shoppers: whether 'tis nobler to return to the car to get the reusable sack lying on the back seat, or simply accept the store's bag. The consequences for each option, are rated by valence, temporal proximity, and certainty.The most powerful contingencies (i.e., the PICs and NICs) support taking the store's bag and *not* returning to the car. The green behavior has immediate and certain negative consequences that are likely to be avoided, while its positive consequences are uncertain and mostly in the future, and therefore weak motivators in comparison to those in place for using the store's bag. If our shopper happens to have all the time in the world and an appreciation of any opportunity for a little exercise, or if his roommate will glare disapprovingly at him for returning home with superfluous plastic, the valances might change enough to tip in favor of making an extra stroll through the parking lot, but we think this analysis fairly represents a common scenario.

The pattern of engaging in one behavior—typically, business as usual that is undesirable from an environmental point of view but maintained by powerful consequences—and a "greener" alternative behavior associated with either strong negative consequences or with weak consequences—can be observed repeatedly when it comes to the failure to make green decisions (see Figure 2). Riding public transportation takes longer, or requires an immediate fee, or entails some walking and braving the elements; the car is dry, and comfortable, and has a cup holder. The reusable bag often must be purchased (another fee) and it must be remembered: approaching the checkout line with a full cart is no time to run back to the car for those hemp satchels, which could make you late for day care, or yoga class. Recycling ink cartridges or CFLs may require mailers or a trip to a separate collection facility, which just feels like work!

The good news is that when natural consequences don't reinforce paying more for local produce or hanging laundry on the line to dry or taking the coffee grounds and potato peelings to the compost pile, we can contrive behavior-consequence contingencies that make such green acts more likely. In fact, to some degree this practice is already catching on.

Rewarding Green Behavior

Richard Thaler (2012), University of Chicago economist and co-author of the best-seller *Nudge: Improving Decisions About Health, Wealth, and Happiness* began a New York Times essay, Making Good Citizenship Fun, as follows:

> Governments typically use two tools to encourage citizens to engage in civic behavior like paying their taxes, driving safely, or recycling their garbage: exhortation and fines. These efforts are often ineffective. So it might be a good time to include positive reinforcement. Rewarding good behavior can work.

Thaler went on to describe several examples of reinforcement-based government campaigns to promote behavior that many people avoid, including obeying the speed limit in Sweden, paying taxes in China, and picking up dog poop off the sidewalks in Taiwan. More than 4,000 people in New Taipei City collected 14,500 bags of canine feces. For each bag of excrement turned in, they received a lottery ticket for a chance to win a gold ingot valued at $2,200 (BBC News Asia, 2011).

The potential of lotteries to get more residents to participate in curbside recycling has not been lost on municipalities. The

Antecedents	Behavior	Consequences	P/N	I/F	C/U
- Heading home after a long day - Thinking about dinner to make/bills to pay/fantasy league line-up - Parked at grocery store (dinner won) in what must be the next county - Looks like rain soon? Was that thunder? - See lottery ticket container at checkout; shoppers who bring a reusable bag entered in weekly drawing for $25 gift card	Accept Store's Bag	- Home sooner	P	I	C
		- Less effort	P	I	C
		- Stay dry	P	I	C
	Return to Car for Reusable Bag	- Delay getting home and dinner	N	I	C
		- More effort	N	I	C
		- Praise from cashier wearing "Eat More Kale" T-shirt	P	I	U
		- Reduced personal carbon footprint	P	F	C
		- A little less plastic in landfill	P	F	U
		- Fewer bags manufactured and shipped to store	P	F	U
		- Win $25 store gift card	P	F	U

P/N = positive/negative; I/F = immediate/future; C/U = certain/uncertain
Font size depicts the relative power of each consequence to select for or against the behavior that produces it.

Figure 2. A PIC-NIC at the grocery store. Existing consequences for green responses are often weak in comparison to those produced by the environmentally harmful alternative.

city of Dayton, OH, for instance, devised a program—begun in the autumn of 2011 and funded by a corporate gift to the city—that every two weeks awards $100 to two households randomly selected from those that recycled with electronically tagged bins. Was such a modest sum sufficient to change recycling behavior? Dayton, which spends $2.6 million annually on trash removal, was certainly pleased with the early results: a city official claimed that recycling participation increased by 40% during the first month of their program, and they set a goal of doubling their monthly recycling, from 500 to 1000 tons. The 500-ton difference would save the city an additional $19,000 per month in landfill fees to dispose that much trash (http://www.cityofdayton.org/departments/pw/wc/Pages/Recycling.aspx).

Why do people do the green behavior required to enter lotteries when winning is a delayed and highly uncertain consequence? One possible reason is that the low probability of winning is offset by the tremendous value of the potential reward, but that is usually not the case for the lotteries we're discussing here (New Taipei City gold ingots notwithstanding!). In any event, a big prize does not address the question of why people who have never won the jackpot continue to buy lottery tickets or perform some other entry response week after week.

To understand why we continue to engage in behavior that is neither frequently nor predictably reinforced, we must turn once again to Messieurs Darwin and Skinner, and appeal to selection by consequences. As a species, survival is more likely if we continue searching for food even though we failed in our last several attempts at catching the fish; continuing to engage in behavior that is only intermittently reinforced is adaptive. Our capacity to continue to respond in the absence of apparent maintaining consequences is a product of the contingencies of survival operating over myriad evolutionary generations. Its expression in the form of buying lottery tickets is a result of contingencies of reinforcement operating over an individual's lifetime.

Common Limitations of Lottery Based Incentive Programs

We are delighted that efforts to reward good behavior are catching on as a way to ameliorate social problems. Lotteries and related incentive systems are both practically effective and conceptually consistent with behavioral principles. The overall impact of most such programs, however, is limited by two shortcomings: restricted footprint and—believe it or not—predictability, both of which are fairly easy to resolve.

Restricted Footprint

The reach of many lotteries designed to provide incentives for sustainable practices is limited because the programs operate in a restricted setting, reward a single form of green behavior, and award prizes to individuals.

Most programs operate in a *restricted setting* which limits the locations where participants can act green. Only while in the checkout line could shoppers at the grocery store receive a lottery ticket. What if the program was also in effect in the parking lot, in produce area, at the dairy case, and in canned goods? Wait a minute you say; shoppers don't use their eco-friendly bags in the cereal aisle. You're right. And that brings us to a related limitation of many lotteries.

Sustainability requires changing a wide variety of behaviors that impact water conservation, air quality, energy efficiency and use, transportation, agriculture, and waste reduction (McKenzie-Mohr, 2012). Incentive programs that focus on a *single behavior* or sustainable practice may be good for our conscience but not optimal for our carbon footprint. What if getting a lottery ticket depends on a customer performing some combination of green behaviors that will only be determined at the register? The program could be set up so that if performing multiple green responses—for example, in addition to carrying a reusable bag, buying some locally sourced produce or items with reduced packaging—results in more tickets, and thereby a better chance of winning, or of winning a more valuable prize. Or perhaps just one of those three good green deeds would yield a ticket to the drawing, but the shopper doesn't know which behavior will pay off until it's identified on his receipt. Under these circumstances that hike to the car for the eco-bag becomes relatively less aversive; a shopper may still decline the exercise because she has local produce and reduced packaging items in her cart. Either way, these customers are now thinking and, more importantly, acting green.

Achieving sustainable communities will require contributions by everyone. Incentive programs that recognize *individual winners only* are likely to have less impact than programs that capitalize on community involvement, peer support and cooperation (Alavosius & Newsome, 2012; Neuringer & Oleson, 2010; Nevin, 2010). A little bit of positive peer pressure can help as well. For example, Haisley, Volpp, Pellathy, and Lowenstein (2012) employed a lottery to encourage teams of employees to participate in workplace health risk assessments. All members of any group winning the lottery received a bonus if their group had a high rate of participation. Dollar-for-dollar, the group-based lottery resulted in greater impact than paying individual employees to participate. The researchers postulated that the group-based lottery's effectiveness was due in part to a mechanism they termed "regret aversion;" a team member would participate rather than risk being the one who cost her group the bonus.

Another incentive program employing a group contingency operates in the city of Easton, PA, in conjunction with RecycleBank (Sieger, 2011). Residents earn points, dispensed and redeemable on line, on the basis of the quantity of recycling collected in their respective neighborhoods; the more that households participate and the more material they recycle, the more points each participating household earns.

Predictability

While winning a lottery is unpredictable, the response required to enter one is typically under the control of predictable conditions: present a reusable bag at the checkout line, receive a ticket. The clear and predictable "if-then" behavior-reward contingencies at the center of most incentive programs, while effective in promoting initial behavior change, can work against long-term maintenance. When the presence or absence of the contingency is easily discriminated ("If I take the bus to work on Double-Your-Ride Day, then I'll get a token for a free ride next week."), people are less likely to respond when the contingency is not in play ("The game's off. No need to respond now."). Making things less predictable can enhance an incentive program's effectiveness. How might that be done?

To start, not every response we want to increase needs to be followed by a reward, even if the reward is an intermediate placeholder like a lottery ticket. In fact, behaviors reinforced on *intermittent schedules* occur at higher rates than do behaviors receiving continuous reinforcement. Getting multiple responses per reward is not just good husbandry of resources to keep a reward-based program going (city officials in Taiwan could no longer afford to exchange dog poo for gold!): behaviors reinforced on intermittent schedules are more likely to continue occurring in the absence of reinforcement longer than are behaviors with a history of continuous reinforcement.

Sustained responding is most likely on intermittent schedules in which it is impossible for the participant to predict whether or not the next response will be rewarded. Applied behavior analysts refer to this type of intermittent schedule of reinforcement as an *indiscriminable contingency* (IC). Researchers in ABA have used ICs to promote generalization and maintenance of a variety of behaviors—from helping young children to share toys (Fowler & Baer, 1981) and select healthy snacks (Baer, Williams, Osnes, & Stokes, 1984), to assisting students to maintain improved levels

of academic productivity (Freeland & Noell, 2002; Kelshaw-Levering, Sterling-Turner, Henry, & Skinner, 2000), to coaching adult vocational trainees to respond appropriately to feedback from co-workers and supervisors (Grossi, Kimball, & Heward, 1994).

We believe these studies and others suggest that making reward contingencies indiscriminable across environmentally friendly behaviors, settings and time would increase the initial occurrence and maintenance of green behavior (Heward & Kimball, 2012). A green behavior change program featuring a well-designed IC would provide participants with a radically different and enticing "if-then" contingency: When you can't tell which of several green behaviors performed exactly where or when will produce a reward, the best strategy for optimizing reward is acting green in every way, everywhere, all the time. Could ICs help make programs like Bowdoin's inter-dormitory energy saving contest more effective and more sustainable?

Let's Play Conservation Clue

An IC approach to enhancing existing green initiatives amounts to a temporal, spatial, and/or behavioral extension of the program's contingencies. Because an IC system can be designed, either for individuals or groups, to address many responses (or parameters of responses) in many settings with many rewards, it can be thought of as a multidimensional lottery, or a game of "Clue"™. Such an approach for increasing the variety, amount, and sustainability of green behavior change may be undertaken anywhere there are multiple repeatable responses that can be performed by many people in a manner that can be monitored and rewarded. Campus projects could be enhanced with "Conservation Clue," a new whodunit competition, but instead of trying to evade getting caught, players are leaving clues of their good green behavior all over the place.

	Where We Live	Where We Work	Where We Shop
Settings			
Behaviors	unplug reduce water use reduce heat and A/C reduce solid waste (recycle & compost) reuse containers	recycle paper/waste carpool/take public transportation power down idle equipment use vehicles efficiently reuse materials	buy locally sourced food and goods buy products in bulk or reduced packaging buy items made with recycled content shop with reusable bags
Measures	plugs in use bulb counts utility bills meter readings weight of recyclables purchase receipts	public transit receipts GPS data from fleet vehicles employees initial re-used materials green officer verification	store receipts bar code scans cashier verification
Rewards	discounts at local shops recycle bin stickers utility bill discounts point accrual virtual rewards	recognition extra breaks lunch with the boss company gear cash bonuses	reduced cost items gift cards charity donations in shopper's name electronic fanfare public posting
The Game	jar drawings dice rolls dart throws 	spinners wheels of chance lotteries 	random item on sales receipts half-off raffles

Figure 3. Examples of target behaviors, measures, rewards, and gaming fun that could be used Conservation Clue played where we live, work and shop.

1. Target Green Behaviors

Reduce, Reuse, Recycle—and Repeat—are the watchwords here. ICs are best suited to support green behaviors that entail oft-repeated responses such as turning off lights, unplugging electronics, or taking public transit; one-time-only behaviors such as buying a plug-in hybrid or putting solar panels on the roof do not lend themselves to this approach (though they certainly can be made attractive in other ways; see Chance & Heward, 2010).

Naturally, it is desirable to target behaviors that will yield the greatest green dividends per response and that require little or no monetary cost (Gardner & Stern, 2009). Examples in the dormitory would include unplugging computers not in use, taking shorter showers, adjusting thermostats and window blinds to reduce energy used for heating and A/C, repurposing packaging, and recycling food and drink containers. Figure 3 shows green behaviors that could be targeted for games of Conservation Clue where we live, work, play and shop.

2. Determine How to Detect and Measure the Behaviors

We referred to Bowdoin's on-line dashboard as a means of real-time energy use monitoring (http://buildingdashboard.net/bowdoin/#/bowdoin/coles/), but its aggregated data are divorced from behavior. What did individual students actually do to reduce their consumption so much? This is the level of analysis and intervention for ICs: things like unplugging and keeping lights off and limiting the type and hours of screen or audio entertainment. Each of these behaviors have to with residential energy consumption, but there should be other domains of interest as well, such as recycling or using public transportation. Some behavior leaves products or traces that are readily counted—outlets or bulbs in use, relative volume in recycle bin—while other desirable responses might need to be recorded in a more contrived way, such as punches on a bus pass, or tickets dispensed for employing a reusable bag. In any event, people will need to be recruited to monitor and count green actions, and while this may seem like a slight logistical deterrent, it can pay off in terms of providing additional prompts, modeling, or incidental reinforcement for the targeted behaviors. Every campus has student clubs or service groups whose mission includes environmental issues and sustainability and whose members would jump at the opportunity to be a "Conservation Clue Detective"—or, for conceptual consistency, an "Agent of Selection"?—and it is likely that interest will grow as the game progresses and green choices become socially normative (McKenzie-Mohr, 2012).

Figure 4. There's a new sheriff in town – hot on the trail of clues left by doers of green deeds!

3. Ready the Playing Field

Just as athletes play better on a well-groomed diamond or rink, Conservation Clue gamers will perform better in well-prepared environments. Preparation entails two actions: minimizing barriers to responding and alerting participants to the opportunity to play (in other words, providing prompts to engage in green behavior).

The principle of least effort (Friman & Poling, 1995), which often selects against the green acts, can be put to good use. Make the targeted behaviors as easy to do as possible; while raising barriers for the undesirable alternative responses (see McKenzie-Mohr, 2011). People are more likely to recycle when they don't have to hunt or walk far for a recycling bin especially if those bins are dedicated to single-stream recycling that eliminate the need for sorting (Brothers, Krantz, & McClannahan, 1994; Geller, 2012). We are more likely to take the campus shuttle if it is quick and reliable, and perhaps even more so if having a car entails additional fees or if parking is limited and expensive.[5]

Posted reminders to respond are seldom sufficient by themselves, but strategically placed prompts can help, especially when combined with people modeling the desired behaviors and an incentive system (Aronson & O'Leary, 1982-1983; Bekker et al., 2010). The scenario depicted in Figure 2 is based on a real program we encountered while shopping at a local branch of a national supermarket chain. At checkout, customers who brought their own shopping bags received a lottery ticket to put it in a coffee can near the register. Prominent signs posted at the store's entrance—"Bring your own bag and get a lottery ticket!"—would probably turn around a good portion of shoppers who left their bags in the car (a much less difficult and time consuming response than later giving up one's place in the checkout line to retrieve the forgotten bags). In the store we observed, the reusable bags available for purchase were located past the checkout area. Locating the rack of eco-friendly bags in the checkout area prior to the register (with another reminder sign on the rack) would get more shoppers who don't have a bag to buy one.

4. Select Rewards

Gold is nice, but when it comes to effective rewards, behavioral and social psychologists have learned that magnitude doesn't necessarily matter (Geller, 2012; Schultz et al., 2007). Simple, relatively inexpensive opportunities abound on campus for Conservation Clue rewards, including such things as school insignia wear or swag from the campus store, a discount at the bookstore, lunch with the dean, or gift certificates for local green business. Virtual merchandise, digital objects such as stars, trophies, and green leaves that gamers can receive and collect

Figure 5. Strategically placed response prompts are most effective when combined with incentives and people modeling the desired behavior.

on-line can be an effective and fun form of reward (Pritchard, 2010; Twyman, 2010).

It may be possible to reward individuals, but recognizing group effort is a natural way to capitalize on a spirit of competition and to mobilize and maintain greater interest in the game. In this vein, ongoing public posting of winners, or leaders in various categories may be desirable. Winning teams might be selected weekly at first—but which day?—with the interval between drawings gradually increasing to an average of every 2 to 4 weeks; prize drawing could be unannounced and determined randomly by the "Selection Agents." A grand prize or just a celebration of sustainability, such as a dorm event catered by a local green business, could take place at the end of the school year.

5. Make It a Game

Create a game-like procedure for randomly choosing which green responses, emitted where and when will earn rewards. The process for determining winners described here is based on the Three Jar method, which is used to implement ICs to promote social and academic behavior in the classroom (Brame, Ernsbarger, & Heward, 2001; Maheady & Jabot, 2012). As Figure 6 illustrates, the three variables are the residence hall, the evidence for green behavior that will be assessed, and the degree to which those behaviors must be demonstrated. Each "jar" would contain cards on which were written, respectively, all possible residence names, desired green behavior, and possible criteria. In a literal example of how a round of the game could be played, judges would randomly draw cards from respective jars designating (a) a residence hall, (b) three forms of evidence for green behavior that it is hoped will be observed in the building or among its residents, and (c) the criteria for the selected evidence. There would be a separate drawing for a residence, but each would have the same odds of being evaluated for a behavior and according to the same criteria. Thus, in our made-up example, judges would (a) visit Smith Hal looking for (b) computers off, appliances unplugged, and recycle bins in use, and would be looking (c) only in the common areas for just one of these three forms of evidence. To add another layer, for each drawing there could be an initial qualifying dorm requirement, such as water or electric meter readings proportionally at or below the previous reading. If the criteria were met, the denizens of that residence would be eligible for the reward being offered for that round of the game—perhaps drawn from a fourth jar.

Of course, this example is just an outline of but one of countless ways Conservation Clue might be played. The rules and materials—spinners or dice or dart boards—should be selected to suit the setting; the crucial element is that multiple forms of green behavior are rewarded in a way that is utterly unpredictable…and fun.

6. Evaluate, Revise, and Play Again

In the spirit of the behavioral science from which it is derived, then, Conservation Clue should be an empirical endeavor. It is important to gather baseline data for some period of time—at least a month or a quarter while the game is being designed—against which to measure any gains that subsequently come as a result of the playing. What to measure? Data abound, in the form of energy and resource usage and money expended. The game of course has many variables to monitor and experiment with, such as which green behaviors are more malleable , or which rewards are most preferred, or what interval of time between drawings is optimal. One datum that should not be neglected is social validity, which is to say, player satisfaction. Periodically checking with consumers or residents or students about what they like and don't like, or what they would suggest in the way of modifications to increase the program's effectiveness, efficiency, and longevity of the program is essential.

We should of course be confident that the game is having an impact, and the issues that compel us to play are serious, but Conservation Clue is, after all a game: Don't forget to have fun!

Reasons for Optimism

Government policies and efforts by conservation groups have led to significant environmental successes: poisonous

Figure 6. Conservation Clue gamers will act green to get caught in these cookie jars!

insecticides such as DDT have been eradicated from the food chain, fish now swim in a river once so polluted it caught fire, tracts of forest and wetlands have been preserved, and some species removed from endangered lists (Kareiva & Marvier, 2012). But we are burning fossil fuels, depleting finite resources, and degrading the environment at such a frightening pace that it is not unreasonable to ask, can we change our ways enough to turn back the clock on climate change? There are good reasons to answer yes.

Human ingenuity and resilience have enabled our species to not only survive, but also thrive in the face of countless threats. Although climate change is as grand a challenge as humanity has ever faced, we know more about the Earth's systems and our place in them than ever before. Oceanographer Sylvia Earle:

We are the luckiest people ever to come on the planet because we, for the first time, can see ourselves in context of all the rest of life on Earth and realize how special it is to be alive at all. . . The point that gives me hope is that I see where we are now as the sweet spot in history. . . Fifty years ago, it was too soon to know what we now know or to take action that we now know we can take to perhaps secure an enduring place for ourselves within the systems that keep us alive. And 50 years from now, if we don't do something right now, we will have lost the chance to do things that are now available to us. – (NPR Talk of the Nation, June 25, 2012)

Scientists and researchers around the world are working to find technological solutions to problems of energy production, transportation, and agriculture. But the clock is ticking, and to buy enough time for scientists and engineers to discover and develop crucial technologies of abatement and replacement, the *behavioral wedge* must be broad and deep.

There is no shortage of organizations and groups who recognize that we can no longer conduct business as usual, and changing behavior is no small part of their efficiency and curtailment efforts. Of 23 projects that target "own-source carbon reduction" in Bowdoin College's 2009 Blueprint for Carbon Neutrality (Bowdoin College, 2009), behavior change accounts for the third largest share, amounting to an estimated annual offset of 590 tons of CO2—the equivalent of each of its 1839 students driving 544 fewer miles per year.

Conservation Clue is one way to back our good intentions with some consequential muscle. It harnesses the power of selection by consequences to work for the greater good. The behavioral changes may seem trivial at first, and indeed, they probably need to be—people are less likely to engage in novel behavior that comes at even a small cost in time or effort. But many small actions can redefine what it means to "act locally"—put our trash in the recycle bin on the right rather the trash bin on the left, or open our backpacks in response to 'paper or plastic?'—and have global impact.

Imagine a version of Conservation Clue being played by students at all 665 colleges and universities whose presidents have pledged to achieve carbon neutrality on their campuses by 2020 (ACUPCC, 2013). That would be a great start. But mitigating climate change and achieving sustainable societies worldwide will require behavior change on a scale far beyond anything that can be accomplished on college campuses. It will require millions of people around the world repeating multiple green behaviors every day.

Imagine Conservation Clue being played by the residents of London or Shanghai, the drivers on the New Jersey Turnpike, or within a major corporation with a global footprint. What if WalMart's more than 2 million employees at all of the company's 4,253 stores around the globe engaged in a full-fledged game of Conservation Clue? What if they then invited the 200 million customers who shop at their stores each week to join in the fun?

Now let's imagine how such a grand and green vision might happen. Participants in a well-designed game of Conservation Clue learn that they could be rewarded for committing a variety of green acts, at unpredictable times and places. That experience increases the probability of players taking their newly expanded, well practiced, and indiscriminately rewarded repertoire of

sustainable practices into their everyday lives, beyond campus and the college years.

Many of today's students will become corporate and civic leaders. Remember the student who asked, "How can we incorporate this month-long competition into our everyday life?" Imagine this student in the near future becoming a member of a company's board of directors or mayor of a town looking for a way to increase sustainable practices. The board or city council kicks around one idea after another for getting its employees or citizens to engage in sustainable practices . . . and the former says, "Let me tell you about a game we played in college that helped us make green choices and have fun doing it. We called it Conservation Clue."

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Endnotes

1. See http://www.bowdoin.edu/sustainability/activity/2011/2011-energy-winners

2. Muller's declaration was especially notable because the largest single donor to his Earth Surface Temperature Project was Charles Koch, the petrochemical billionaire who, with his brother David, has donated more than $67 million since 1997 to groups that deny climate change (http://www.greenpeace.org/usa/en/campaigns/global-warming-and-energy/polluterwatch/koch-industries/).

3. Conservation groups, environmental activists, and sustainability writers use a variety of overlapping and sometimes confusing terms for human activity that is more or less environmentally friendly, and the matter of which terms are the most current and precise can be controversial. We have no intention of tackling these terminological issues, and for the most part have opted to use "green behavior" to encompass acts that directly protect or preserve the environment and/or contribute to sustainable practices.

4. Reviews of early ABA research on fostering green behavior and descriptions of current interventions can be found in Heward and Chance (2010), Lehman and Geller (2004), and Luke and Alavosius (2012).

5. Even more effective than making green behavior easy, is modifying the environment such that sustainable practice is the default response. When a company "de-lamped" one of its distribution centers by removing a portion of ceiling light bulbs, the change had a minor effect on visibility but saved thousands Kwh of energy and required no behavior change by employees (Knott, Kernan, Luke, & Alavosius, 2012).

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Entertaining Health: Inspiring Writers and Producers to Create Storylines That Change Knowledge and Behavior

By Sandra de Castro Buffington
Director, Hollywood, Health & Society

Storytelling, like love, is a universal language, captivating people in every culture around the world. Today, people curl up together at the end of a long day to relax and watch favorite TV shows and movies. Day or night, they can view their favorite episodes on tablets, smart phones and computer screens, or create their own stories and upload them to social media sites.

"Great stories communicate simple truths that reflect the dimensions of the human soul," said one leading Hollywood producer. "Powerful characters help us understand our lives; their stories reflect our core values as human beings. Meaningful themes universalize the human experience and help the audience relate."

Television, movies and emerging media are among the most powerful tools available for communicating health and climate change messages to the public. A growing body of research indicates that storylines in entertainment shows can affect outcomes, including awareness of health risks, attitudes toward prevention measures, policy priorities and behavior change. The great jazz musician Charles Mingus said, "Anyone can make the simple complicated. Creativity is making the complicated simple." Storytelling through media can simplify the complex world of public health and make it accessible for viewers.

In the United States, the groups with a disproportionate health risk include Hispanics and African-Americans. These groups experience more challenges with regard to health literacy and access to care, watch more TV shows, and consistently report more effects after viewing health storylines—whether it's discussing a health topic, calling for information, visiting a clinic or taking preventive measures (Beck, Huang, Pollard & Johnson, 2003).

Examples of health storylines that have generated strong audience response are found in shows that are popular among minority viewers, such as:

- *Law & Order: SVU*: African-American viewers who saw a diabetes storyline involving an obese African-American youth were much more likely than other viewers to report their intention to eat a healthier diet and exercise more (Murphy et al., 2006).
- *Amarte Así:* A telenovela (Spanish-language soap opera) that addressed diabetes and posted a web link for more information on their home page generated 37% of all web hits to the CDC's diabetes site for the month the storyline aired; National Institutes of Health was the next highest at 9% (CDC NDEP, 2005).
- *ER*: Men who have sex with men (MSM) who saw a syphilis storyline were twice as likely to say they would get tested for syphilis, compared to non-viewers (69% vs. 33%). (Whittier et al., 2005).
- *The Bold and the Beautiful:* The highest spike of callers all year to CDC's AIDS hotline occurred when a PSA/800 number aired after an episode that featured a young Hispanic character telling his girlfriend that he was HIV-positive. (Kennedy et al., 2004).

Favorable outcomes such as these are particularly likely when audience members are "transported" into the narrative, meaning a measure of engrossment that occurs when viewers lose track of time, forget their surroundings, and feel as if they are experiencing the events portrayed. In this state, viewers tend to suspend their disbelief, heightening the persuasiveness of the storyline and accompanying health or science messages. (Green et al., 2004). Therefore, it's especially important that storylines, first of all, transport viewers through high-quality entertainment and, second, portray health or climate change *accurately*.

Toward that end, Hollywood, Health & Society, a program of the Norman Lear Center at the University of Southern California's Annenberg School for Communication and Journalism, was established in 2001 with the goal of leveraging the power of entertainment media to improve the health and well-being of people worldwide. Through popular TV shows and movies, we reach viewers on a wide range of public health topics to motivate action on a massive scale. The most popular TV shows we work with in the U.S. reach up to 20 million viewers in an hour; through syndication, that number jumps to over 400 million viewers in more than 100 countries around the world.

HH&S provides resources to Hollywood writers and producers through a sustained and systematic program of outreach—from expert briefings to research trips—and the results have been impressive. The program assisted with more than 565-aired health storylines on 91 shows across 31 networks from 2009-2012. The 2,000 weblinks we posted on shows' web and social media sites provided viewers easy access to credible health resources. HH&S also worked with TV networks to create and air public service announcements featuring the lead characters in the story referring viewers to call-in hotline numbers and web sites.

A sampling of the shows HH&S has worked with includes *90210, Army Wives, Beauty & the Beast, The Big C, Boardwalk Empire, Bones, Body of Proof, Breaking Bad, Castle, CSI, CSI: Miami, CSI: New York, Cult, Days of Our Lives, Dexter, Doc McStuffins, Elementary, Falling Skies, Fringe, The Good Wife, Grey's Anatomy, Hawaii-Five-O, House, In Treatment, Law & Order: SVU, The Offic*e, *Mad Men, Monday Mornings, NCIS, Parenthood, Perception, Private Practice, Royal Pains, Switched at Birth and Touch.*

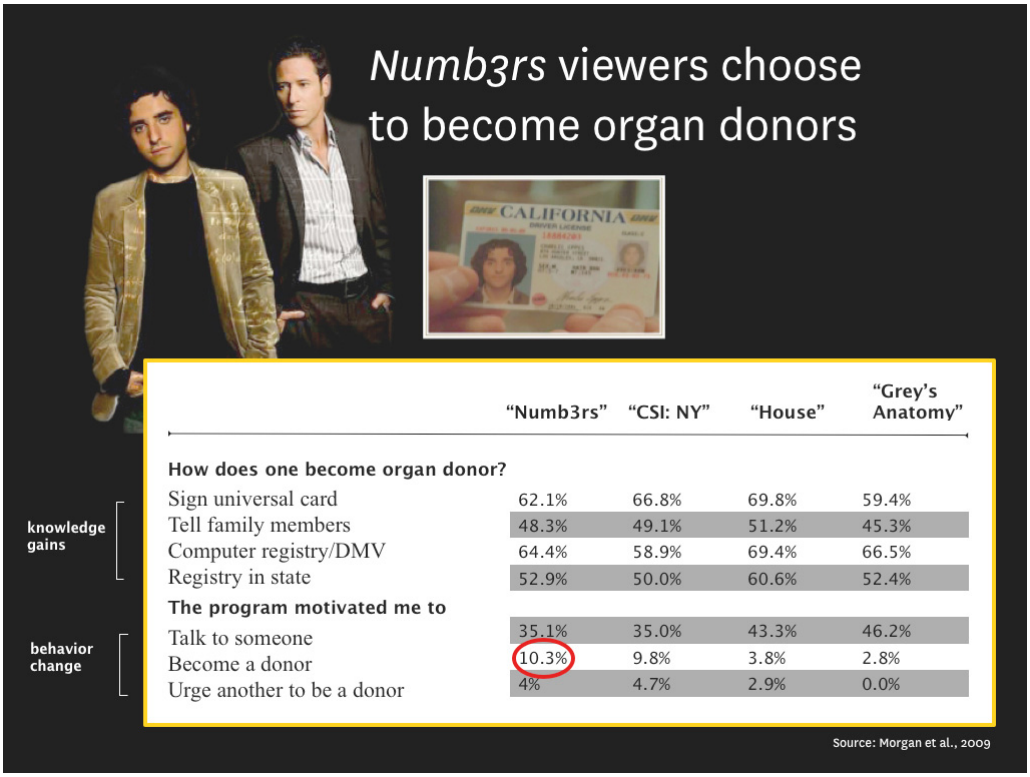
Funded by the Centers for Disease Control and Prevention, the Bill & Melinda Gates Foundation, Skoll Global Threats Fund, and The California Endowment, among others, HH&S has built a successful track record of working with the U.S. entertainment industry, and more recently with the creative capitals of India (Bollywood) and Nigeria (Nollywood). We have had a measurable impact not only on the frequency and accuracy of health-related storylines, but also on audiences' knowledge, attitudes and behavior. Key findings from the HH&S and Lear Center's ongoing program of research include the following:

- A BRCA-gene breast cancer storyline (*90210*) motivated 11.5% of viewers surveyed to schedule a doctor's appointment to talk about their risk of breast cancer. (Rosenthal et al., 2013)
- A storyline about conflict minerals and rape in the Congo (*Law and Order: SVU*) resulted in increased knowledge regarding sexual violence and immigration and asylum issues, more supportive attitudes toward global health policy priorities and increased discussion of global health issues. (Murphy et al., 2012)
- Ten percent of the viewers of a *Numb3rs* transplantation storyline who were not already registered as organ donors said the episode made them more likely to become a potential donor. (Movius et al., 2009)
- From 2008 to 2011, HH&S tracked a seven-fold increase in global health storylines on topics such as malaria, polio, vaccines, and HIV/AIDS. (Buffington, 2012)

Our experience working with Hollywood has shown that writers and producers of popular TV shows don't see themselves as being responsible for educating viewers about health when they're writing scripts. Instead, they're focused solely on telling the most compelling stories they can, and HH&S supports them in this goal by helping to make their stories realistic and accurate. We find that writers are receptive to including topics about health and, more recently, climate change in their storylines when we inspire them with "real stories of real people," present accurate information, and connect them to experts who serve as resources.

"We know that people learn about health from TV shows, and writers constantly need interesting scenarios to incorporate into scripts," said Dr. Neal Baer, a Harvard-trained pediatrician known for his award-winning TV work as executive producer of *ER*, *Law & Order: SVU*, and *A Gifted Man*, and also co-chair of the HH&S board. "That's why we turn to experts and people who are in the trenches. They give us added grist for storytelling."

As mentioned above in a brief list of research findings, HH&S consulted with the CBS series *Numb3rs* on an organ transplantation storyline. The resulting episode, "Harvest," was one of the most popular episodes of the season with 13.36



	"Numb3rs"	"CSI: NY"	"House"	"Grey's Anatomy"
How does one become organ donor?				
Sign universal card	62.1%	66.8%	69.8%	59.4%
Tell family members	48.3%	49.1%	51.2%	45.3%
Computer registry/DMV	64.4%	58.9%	69.4%	66.5%
Registry in state	52.9%	50.0%	60.6%	52.4%
The program motivated me to				
Talk to someone	35.1%	35.0%	43.3%	46.2%
Become a donor	10.3%	9.8%	3.8%	2.8%
Urge another to be a donor	4%	4.7%	2.9%	0.0%

Source: Morgan et al., 2009

million viewers on the original airdate. In the final scene of this episode, the main characters discuss the importance of becoming an organ donor and the need for more donors in the U.S. One of the characters pulls out his driver's license to show his organ donation sticker and offers his friends applications from the DMV.

To see if this episode had an effect on viewers' attitudes and beliefs about organ donation, HH&S coordinated an evaluation of the *Numb3rs* storyline. Online surveys were used to determine how the episode affected those who watched it. The dataset collected for *Numb3rs* was part of a larger study that included several other episodes from popular primetime TV dramas with storylines that also focused on organ donation and organ transplants. Compared to the other dramas, those who watched the *Numb3rs* episode were the most likely to become donors.

Out of all the episodes about organ donation, the *Numb3rs* episode was the only one to use social modeling to demonstrate how to become an organ donor, and the study's findings suggest that this factor significantly influenced audiences' attitudes and actions. About 10 percent of non-donors surveyed who saw the *Numb3rs* episode decided to become a donor. Results also indicate that the viewers of "Harvest" had "higher levels of perceived importance to become a donor," and would urge others to donate (Movius 2007).

In addition to the entertainment industry, Hollywood, Health & Society achieves its results through outreach to the public and policy makers, evaluation and strategic partnerships. Key elements of the HH&S model are outlined below.

Reaching the industry:

On-demand writer consultations: Via a toll-free hotline, HH&S connects writers with top medical experts specializing in hundreds of different health topics.

Writer briefings: The latest health studies and stories are brought to writers' rooms by a range of experts who discuss their work.

Storybus Tours: Inspiring and informative trips connect writers and producers with local storytellers to inspire them to craft realistic, compelling drama about health and climate change.

Research trips overseas: To learn about global health and culture in a local context, writers meet with storytellers on the ground in countries such as India and South Africa.

Panels: Our panels feature public health experts, writers and producers, and "real people" exploring timely health topics for TV and film.

Writers John Vorhaus (left) and Cindy Lichtman listen to scientist Sassan Saatchi discuss effects of climate change on forest ecosystems. *Photo by Howard Pasamanick*

JPL visual strategist Dan Goods with "Doc McStuffins" creator and executive producer Chris Nee in the Left Field room, where scientists and engineers go to try out and refine "crazy" ideas. *Photo by Howard Pasamanick*

Writers get a tour of exhibits at the JPL museum inside the von Karman Visitor Center. *Photo by Howard Pasamanick*

Tip Sheets: Accessible and current, tip sheets cover a wide range of health and climate topics.

Real to Reel newsletter: Sent to 800 writers quarterly, this digital newsletter features a lively mix of headlines and news reports relating to health.

Best of the Best: Our Sentinel for Health Awards recognizes exemplary TV health storylines, judged by experts from the fields of public health and entertainment.

Reaching the public:

Entertainment storylines in television, movies and news media reach viewers with critical health and climate change storylines.

Facebook, Twitter, and digital content linked to a TV narrative moves audiences across a range of media platforms—known as transmedia—from online webisodes to video gaming and social media.

PSA spots featuring lead characters in a storyline refer viewers to help lines and credible sources of health information.

Reaching policymakers:

Congressional briefings reveal the power of entertainment media to educate viewers.

One-on-one meetings educate congressional staff with short clips of health storylines and impact results.

Educational events such as "Hollywood Meets the Hill" feature leading writers, producers and celebrities to educate Congress about critical health issues.

Evaluation:

Audience impact evaluations: Using survey-based research, HH&S evaluates changes in knowledge, attitudes and behaviors associated with exposure to health-related storylines on TV. Quantitative research approaches include quasi-experimental, experimental, correlational, dosage effects and modeling.

HH&S TV Monitoring Project: Through trained coders, we assess content trends in top scripted TV shows (frequency, accuracy, topic distribution) over time and across demographic groups (gender, age, ethnicity).

Airdate tracking: HH&S tracks inquiries and briefings, and their associated airdates.

Transmedia evaluation: Tracking and analyzing web hits and social media discussions enables HH&S to assess impact of aired episodes of TV health storylines in relation to related new media platforms.

With such resources and a proven track record, is it any wonder that the HH&S model would be a natural fit for the topic of global warming, which involves complex climate science and sometimes seemingly contradictory effects? In the constant back and forth argument about the validity of climate change, audiences must weigh sometimes conflicting factors, as illustrated in this bit of dialogue between Homer and his daughter Lisa from a 2009 episode of *The Simpsons*, surely one of the first TV shows to include climate change in a storyline:

Lisa looks outside the window at a massive snowstorm. Homer, Lisa's father, joins her.
Homer: Hey Lisa, looks like tomorrow I'll be shoveling 10 feet of global warming.
Lisa: Global warming can cause weather at both extremes—hot and cold.
Homer: I see, so you're saying warming makes it colder. Well aren't you the queen of Crazyland?! Everything's the opposite of everything.
Homer begins dancing around the room mocking Lisa.
Homer: Ladi-dadi-da! I'm Lisa Simpson. Ladi-dadi-da!
Lisa: Really? Really? Uh-huh. Alright.

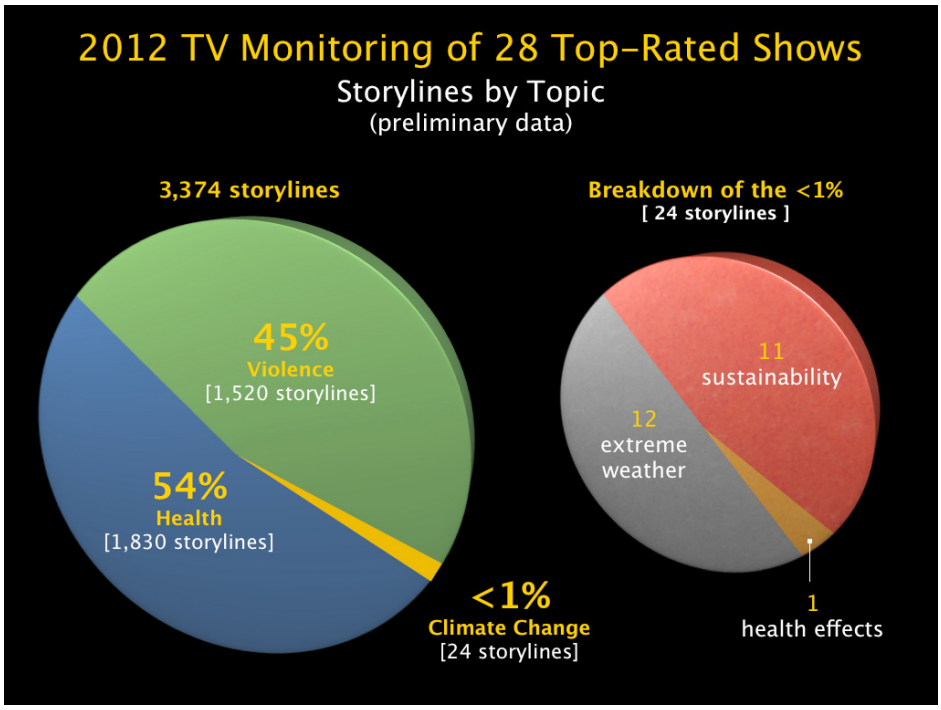
© 20th Century Fox Film Corp.

In 2010, HH&S recognized the need to inform and inspire Hollywood writers on the topic of climate change. The program initially received funding from the CDC to address climate change within HH&S' portfolio of public health topics. Following an article on grist.org by David Roberts about applying the HH&S model to climate change, and a post by Andrew Revkin on The New York Times blog Dot Earth, additional funding for the effort came from the Barr Foundation, the Grantham Foundation, Skoll Global Threats Fund, ClimateWorks and an anonymous donor. Like any other public health topic, the objective is to enable TV writers, producers and other entertainment industry professionals

to accurately portray climate change, which experts say will have a profound impact on people's health.

HH&S's TV Monitoring Project tracks climate change storylines in the top 20 to 30 scripted primetime TV shows. Baseline data were collected from all episodes of the top 10 comedy and drama series for General, African-American, and Hispanic audiences (ages 18-49) that aired between January 1 and May 31, 2012. This sample of 472 episodes of 28 shows coded nearly 360 hours of television content for both health and climate change content.

Preliminary findings of the data from the 2012 season are summarized below:



- Over 3,000 storylines relating to health, violence or climate change were tracked. Of these, only 24 (less than 1%) pertained to climate change.

- Of these 24 climate change storylines, 12 depicted extreme weather events, 11 addressed sustainability topics, and one portrayed the health effects of climate change.

Storylines depicting extreme weather events were featured in major or minor story arcs. In most cases, they did not explicitly mention climate change. Storylines addressing sustainability topics tended to be brief mentions or visual cues.

These baseline data reveal the need for HH&S to inspire and inform scriptwriters to address climate change. In order to measure the extent to which climate change is explicitly mentioned in storylines, HH&S revised the coding instruments for the 2013 TV Monitoring Project to include:

- Depictions of extreme weather events, and whether climate change is explicitly mentioned in relation to them;

- Depictions of the health effects of climate change (e.g., extreme heat, storm-related injuries/deaths, changes in vector-borne diseases);

- Depictions of sustainable practices or technologies (e.g., recycling, use of public transportation, carpooling, purchasing locally sourced food) and whether climate change is explicitly mentioned in relation to them;

- Depictions of characters at various stages of climate change concern (alarmed, concerned, doubtful, dismissive), based on the Yale Project on Climate Change Communication's "Six Americas" Study framework;

- Props, posters, and other set-pieces relating to sustainability issues;

Other climate change-related depictions, including activism/protests, legal action, attempts to affect policy change, ecoterrorism, climate justice, alternative energy resources, climate science/research, climate skepticism and adaptation strategies.

Today, entertainment media are within reach of most people in the world, including those in developing countries. The emergence of international entertainment capitals such as Bollywood and Nollywood presents a unique opportunity for HH&S to facilitate the development of storylines on a wide range of health and climate change topics in the major media markets that serve the developing world. We have recently launched franchises for entertainment education to work with the film and TV industries in India and Nigeria, drawing on the resources of HH&S and its Hollywood partners. Like HH&S—which will serve as the hub—the regionally branded centers are being trained to conduct a sustained and systematic program of industry outreach to increase the accuracy and frequency of socially provocative topics in television, radio, film and new media. The franchises will join HH&S in measuring behavior change and tracking audience engagement with that programming.

Health and climate change storylines with the potential to reach hundreds of millions of people? This is change on a global scale. Improving the health of people worldwide, and possibly helping to heal the planet itself, is just what the doctor ordered.

Sandra de Castro Buffington is director of Hollywood, Health & Society, a program of the Norman Lear Center at the University of Southern that leverages the power of the entertainment industry to improve the health of people worldwide. Sandra provides resources to leading scriptwriters and producers with the goal of improving the accuracy of health-related storylines on top television programs and films, resulting in more than 565-aired storylines over the span of three years. She recognizes the profound impact that entertainment media have on individual knowledge and behavior. For her work, Sandra was named one of the "100 Most Influential Hispanics" in America by Poder Magazine.

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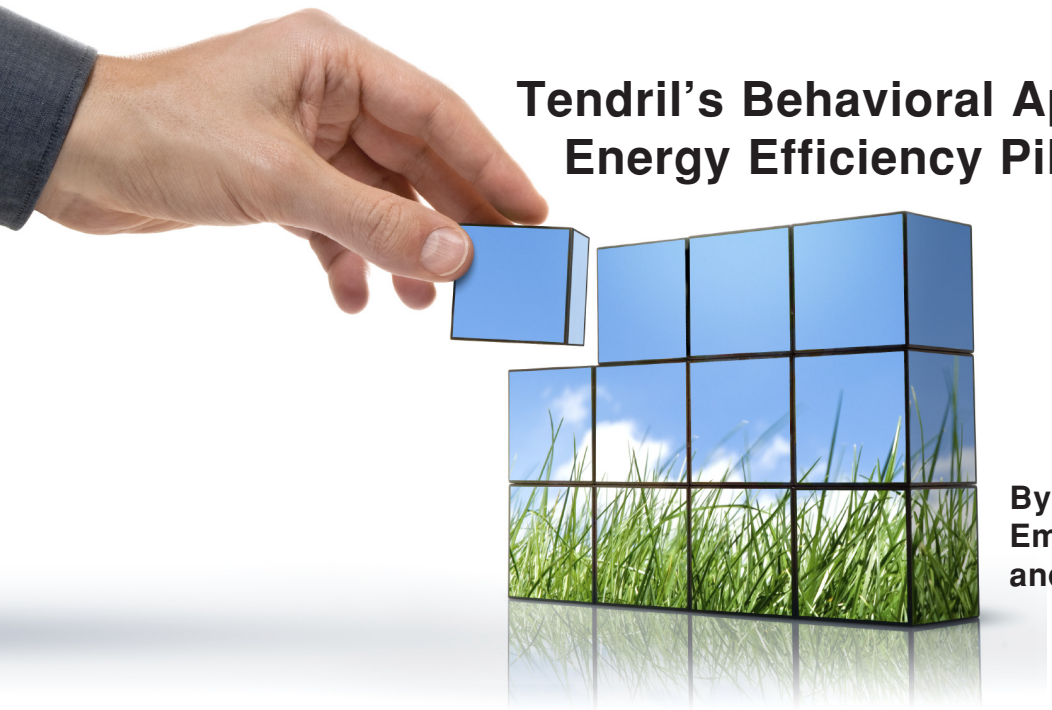


Tendril's Behavioral Approach and Energy Efficiency Pilot Results

By Kyle MacLaury, Paul Cole, Emily Weitkamp, William Surles, and Tendril

Abstract

This paper documents three years of experience delivering residential behavioral efficiency programs enabled by real-time feedback paired with online tools. The technologies and strategies used represent a unique approach to behavioral strategies for energy efficiency that have achieved third party verified annual energy savings exceeding 9%. The technologies employed provide users with real-time feedback on electricity use via a website and optional in-home display. Users set savings goals and were provided feedback regarding their progress toward their goal through the website, and through optional daily, weekly and monthly emails. The social strategies used include anonymous comparison of a user's consumption to the average of similar households, the ability to take a *snapshot* of their energy consumption and post it to a community discussion board, and the ability to interact with an expert in an open forum. The features enable social and active learning, and help to maintain a high level of user interaction with the system. This study found an average of 9% reduction in electricity use compared to weather adjusted baseline use after 27 months in the program. The results demonstrate that individuals' level of engagement, measured as logins, correlates positively with energy savings. This paper also explores the ways in which users interacted with the participatory and interactive tools of the system, and how that contributed to the success of the program.

Introduction

Recent years have seen the beginning of a significant shift in the relationship between utilities and their customers. A number of forces within the industry are responsible for this. Efficiency mandates in many states require that utilities reach out to their customers and encourage them to change the way they use energy. Utilities' desire to invest in smart grid technology has introduced a need to provide their customers with tangible benefits of those substantial investments. In response to these forces, a number of solutions have been developed to connect utilities, their customers and the data generated by smart grid technologies. Many of those solutions are intended to help utility customers reduce their energy consumption through feedback, and a variety of educational and persuasive strategies. A recent review of several smart grid enabled feedback programs demonstrated a wide range of effectiveness in their ability to facilitate a reduction in utility customers' energy consumption (Foster & Mazur-Stommen 2012). This paper looks at the energy savings from the first two and a half years of experience with The Cape Light Compact Residential Smart Energy Monitoring Pilot, one of the programs described in that review. It also describes additional findings since the third party study of the program cited in that review (PA Consulting Group 2010), including several lessons learned from an exploration of how users interact with the various features of the website. The website employs a comprehensive behavioral approach and provides users with a variety of participatory and interactive tools that they can use on their own terms. The results suggest that these types of tools can lead to a successful residential feedback program that achieves high and persistent savings.

Energy Savings through Behavior Change

It is well established that occupant behavior is a significant source of the variation in residential energy consumption (Lutzenhiser & Bender 2008; Morley & Hazas 2011). A number of interventions have been shown to decrease energy consumption in people's homes through behavioral changes. Primary among those interventions is feedback about energy consumption. Feedback through a number of media, and a variety of frequencies and latencies have been shown to lead to decreases in energy consumption relative to groups receiving standard utility bills at their typical frequency. Enhanced bill design, increased bill frequency and instantaneous feedback through in-home displays have demonstrated impacts on residential energy consumption. The literature suggests that the more immediate and frequent the feedback, the greater impact on consumption (Ehrhardt-Martinez et al. 2010; Darby, 2006).

For behavioral energy efficiency methods to be fully accepted by the utility industry, the industry must be satisfied that behavioral changes are persistent and that they lead to the adoption of efficient technologies. Strengthening social norms through social interaction is one strategy to create persistent behavioral changes (Hopper & Nielsen 1991). By making information about peers' energy consumption visible, social comparisons begin to create social norms surrounding energy consumption where they did not previously exist. In recent years normative information has been integrated with feedback to significant effect. The use of descriptive norms in the form of neighbor comparisons has demonstrated effectiveness through the use of paper reports and electronic media (Allcott 2011).

Creating persistent behavior change also requires that new behaviors become habitual, and motivation to be internalized (De Young 1996). Addressing the intrinsic motivation of consumers can be achieved through goal-based methods. The social science literature about pro-environmental behavior indicates that to achieve persistent change, goals, actions, feedback and social environment need to be addressed simultaneously (De Young 1993).

In addition to mediating behavior changes, a social environment is fundamental to the adoption of energy efficient technologies. The adoption of new technologies is largely a social phenomenon that is mediated by interactions in existing social networks (Rogers 2003). The slow adoption of many efficient technologies suggests that existing social networks are not supportive of their adoption. The creation of an online social network, where the use of new technologies is easily demonstrated and viewed, may provide members of the network sufficient social exposure to efficient technologies to facilitate their adoption.

This paper examines ways in which the various elements of a behavior-based energy efficiency application combine to influence a user's energy consuming behavior. The results demonstrate that a combination of elements delivered high levels of engagement and persistent energy savings after 27 months. They also suggest that this persistence arises from the high levels of participation. Participation is defined here as the ability to interact with energy use information and fellow energy users in a meaningful way.

The Application

The application was developed to demonstrate the potential benefits of combining behavior change strategies with the feedback that smart grid technologies enable. It combines feedback about energy use at several intervals (instantaneous, daily, weekly, monthly) and several modalities (in-home display (IHD), website, email) and incorporates a number of proven behavior change strategies into its design. The primary behavior change strategies incorporated into its design are: goal setting with frequent feedback about progress toward goal, feedback about energy consumption through several modalities and scales, peer comparisons, and educational materials including support from an online energy expert.

In most cases, users had a current transformer (CT) based meter installed in the distribution panel of their home. (For a complete description of customer recruitment and installation see *Residential Smart Energy Monitoring Pilot Final Report* (PA Consulting Group 2010)). The meter is wirelessly connected to an Ethernet-enabled device that feeds consumption data to the web application. After the hardware was installed in a user›s home, a welcome email with login information was sent to the user. When users logged in for the first time they were asked to set a savings goal and answer a few basic questions about their home. Upon completion, users could choose to complete a more extensive assessment of their home. This information was used to provide users with a breakdown of how their home uses electricity, by end use, and also to target appropriate content to them. Once users had completed their home assessment they were taken to the *Dashboard* of the site. The site has six primary tabs (*Dashboard*, *Learn and Save*, *Your Savings Plan*, *Your Home*, *Your Town*, *Reports*). Only the most used of these features are

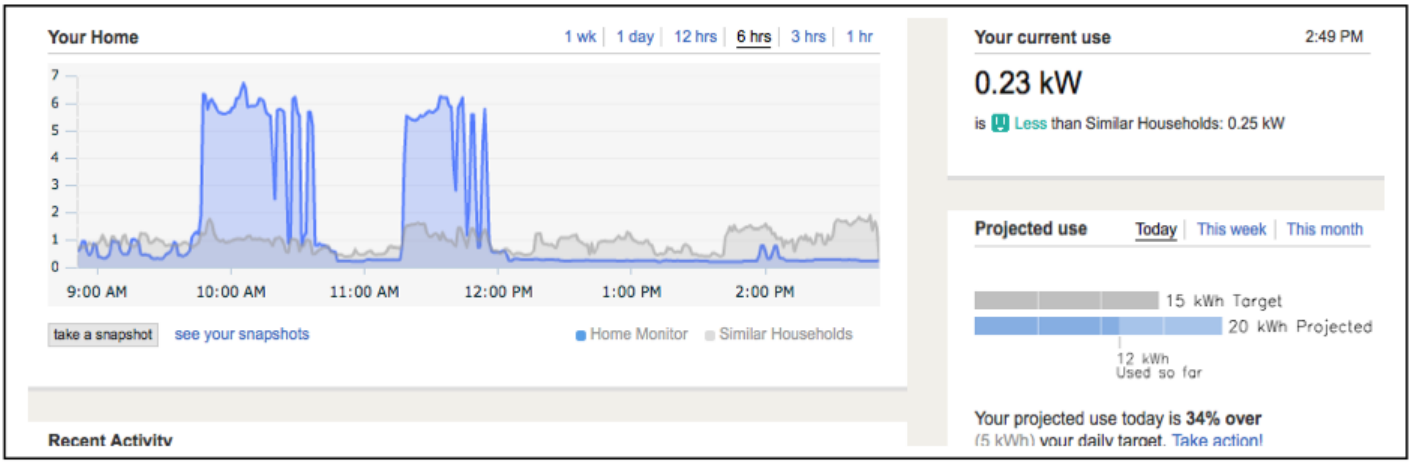


Figure 1. The Major Elements of the Dashboard *SOURCE: WWW.SAVE.GROUNDEDPOWER.COM*

discussed in this paper. The primary landing page for most users is the *Dashboard*, where users can see their current energy consumption, how they are performing relative to their goal, and a list of the most recent social activity on the website (see Figure 1).

Feedback and Goal Setting

Feedback and goal setting serve to make users' energy consumption more visible. This increased visibility serves to solidify users' associations between their energy consuming choices and those choices' subsequent impact on energy consumption. During their initial session on the website, users were required to choose a percentage savings goal. On the website the goal was presented as a daily or monthly kWh consumption limit and was calculated from the user›s consumption during the corresponding month of the prior year. This goal was incorporated into the feedback users receive in several ways. Feedback was available to participants through their in-home display, on the website, and through periodic emails. The in-home display was color coded in such a way that it was green if users were likely to remain below their goal for the day, yellow if they were in danger of exceeding their goal, and red if they were likely to exceed their goal. Through the website, users were able to view their real-time energy consumption in several locations. On the *dashboard,* energy consumption could be viewed as; a numeric value; as a line graph of minute interval data that can be viewed at 1, 3, 6, 12 hour, 1 day and 1 week scales; and as a bar graph that showed the user's daily target, their consumption so far that day, and their projected consumption for the day (see Figure 1). Users could also access a *Reports* section of the website where they could view several standard graphs of their energy consumption, or download their consumption data as a csv file.

Emails

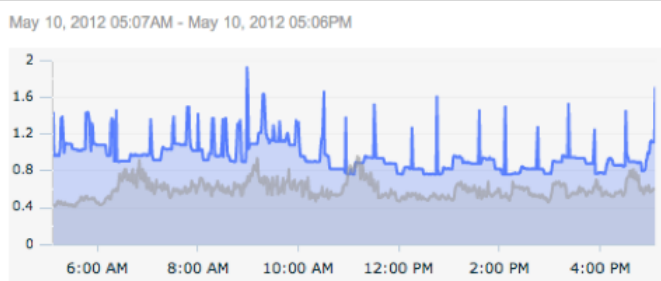
Users received a monthly email that presented the user's consumption during the prior month compared to their goal. The email also provided a link to the reports tab on the website where users could explore their consumption in more detail. Users also had the option to receive weekly and/or daily emails. The weekly and daily emails could be opt-in or opt-out services depending on the utility client's preference. Some utilities chose to make the weekly email an opt-out service; while all chose to make the daily emails opt-in. The daily and weekly emails contained user's consumption from the prior period compared to both their goal and the use of the other individuals in their comparison group. These emails also contained an energy saving tip.

Social Comparison

The social comparison communicated a descriptive social norm to users. During user's first session, they were required to answer a few brief questions about the size of their home and how many adults and children lived there. This data was then used to place the user into a peer comparison group. The neighbor comparison appeared most prominently on the line graph of the user's recent energy consumption found on the *dashboard* (see Figure 1). The comparison was also prominently featured in weekly and daily emails.

Social and Active Learning

The social aspects of the website were critical for the creation of new social norms around energy consumption. There were two primary features through which social interactions took place. The most frequently used social feature on the site was *snapshots*. A *snapshot* is a copy of a specific segment of the user's energy consumption profile. Users could add commentary to their *snapshot* that explains what was going on in their home during the period captured. Through *snapshots*, users were able to ask the experts and community for their experience or advice on what might be going on in their home, and how they could use that information to reduce their energy consumption. It was



Snapshot Taker: What are those mysterious spikes?

User 1: can it be a space heater?

Snapshot Taker: Nope. No dehumidifier. Was thinking it might be an icemaker – nope

User 2: A few observations... It's about 600 watts (so is likely a plug-in appliance), cycle is very brief (a minute or two) every 30-45 minutes, and appears to occur more frequently around breakfast time. Might be a coffeemaker (wattage is too low to be a toaster oven or instantaneous DHW heater) left on during the day: the heating element senses the need to cycle on more when the pot is often removed during mealtime, but only needs to add a bit of heat during the rest of the day to maintain pot temperature. Mmm... coffee... think I'll have a cup...

Resident Expert: User2 makes some great observations. Seems like this may just require some more detective work. Did the spike just start or have they been going on for a long time?

Snapshot Taker: found it…we have a hot water tap at the sink…and I guess every 30-40 mins it gooses the coil to keep the water hot. Thanks for the help

Figure 2. Mysterious Spikes Snapshot *Source: www.save.groundedpower.com*

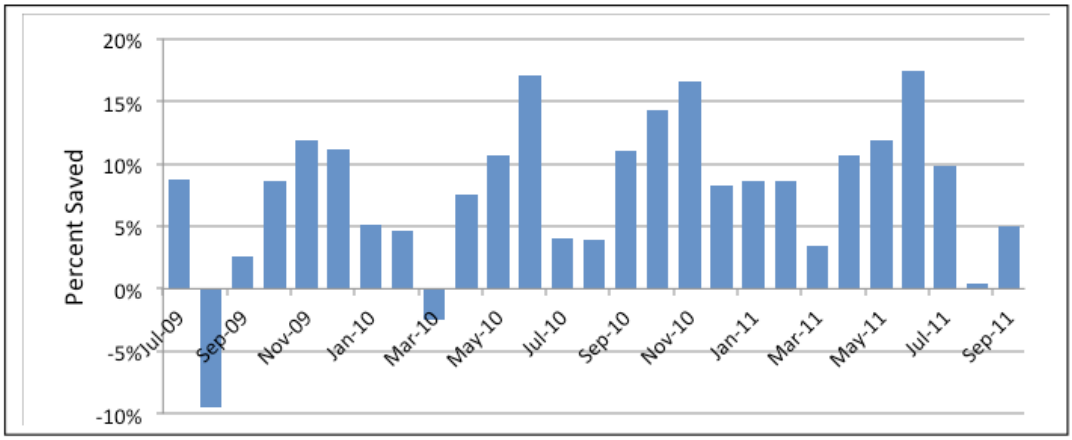


Figure 3. Percent Energy Savings By Month

a frequent occurrence to have a user post a *snapshot* asking what the expert and other users thought was responsible for a given feature on their consumption graph. This often led to an extended period of discussion and discovery that included the expert and several users sharing their experience and asking questions to help narrow the search for answers (see Figure 2).

The second space for social and active learning was through the Expert Forum, which was structured as a typical online forum. Users could post questions about their home energy use or experiences, and receive answers from the resident experts and other users on the site.

Informational Content and Savings Plan

Two of the primary sections of the website were *Learn and Save* and *Your Savings Plan*. Here, users could explore about 100 actions that they could take to save energy in their home. The actions contained a brief explanation of how a user would undertake the action, and how that saves them energy. The actions also had clearly explained savings assumptions and links to related resources. Users could add an action to their Savings Plan, and indicate if they were considering that action, committed to it, or if they had completed it. Users could also make their savings plan public in their user profile. These sections served to educate users about their energy consumption, and provide them with an opportunity to make a public commitment to take action.

Savings Analysis

A savings analysis was performed on the same population (n=91) as that examined in *Residential Smart Energy Monitoring Pilot Final Report* (PA Consulting Group 2010). Using two control groups, this study found savings of 9.3% over users' initial year on the website. A subsequent savings analysis was performed on the same population of users for 27 months after the start of the program. The control group data were not available, so savings were determined by calculating the change in consumption after the start of the program based on 12 to 36 months of baseline data. The savings analysis was performed using a modified version of the baseline development strategies detailed in Annex G of ASHRAE Guideline 14-2002 (ASHRAE Guideline Project Committee 14P 2002). Using this strategy, each household's temperature responsiveness during the baseline period is determined using a change point procedure that identifies non-weather dependent baseline consumption, heating and/or cooling dependent consumption. For each month during the study period a household's consumption is predicted based on its original performance characteristics under current weather conditions. Savings were calculated as the difference between the actual and predicted consumption. This analysis demonstrates average monthly savings of 9% over the 27 months studied ($t(26) = 3.44$, $p < .001$) (See Figure 3). The savings show no sign of diminishing over time. While recent studies have found a wide range of savings from smart grid enabled feedback (with several studies showing much lower savings than 9%), these findings validate the strategy of providing feedback in conjunction with appropriate engagement strategies.

Energy savings are determined by the difference between predicted and actual consumption for each month. Source: Cape Light Compact and Tendril.

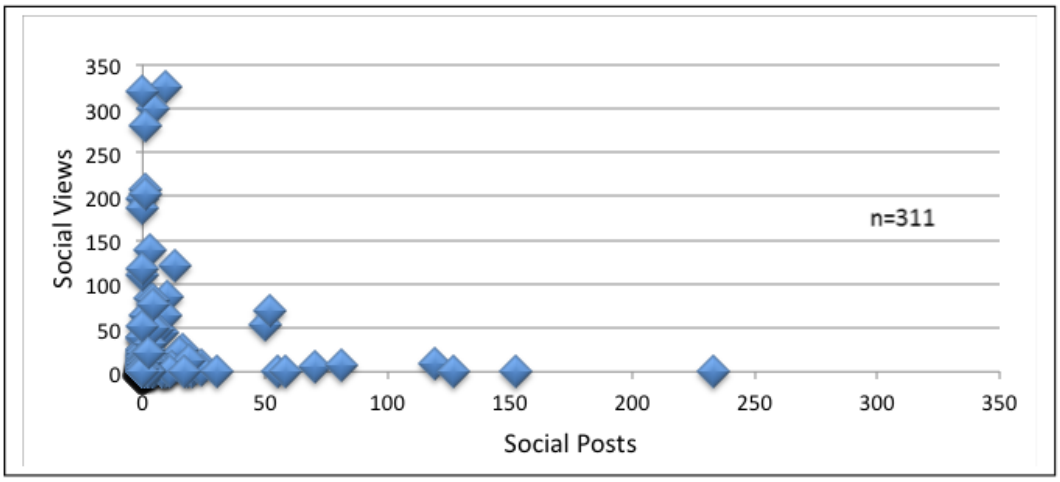


Figure 4. Social Views vs. Social Posts per User *Source: www.save.groundedpower.com*

Engagement Analysis

Engagement is high and persistent. Engagement data (non-savings related) was collected from a group of 311 users. Ninety one of these users were with the original Cape Light Compact study. The other 220 were from pilot groups of municipal utilities in Eastern Massachusetts. The utilities chose to share a common site because the shared site experience increases social interaction by creating a larger community. Some elements of the site are shared by all users, others are only shared within a utility group.

On average, users logged in four times per month over the study period. We define impact opportunities as the number of times the user interacts with the application through the web or email - or the sum of logins plus emails. On average, each user had 15 impact opportunities per month. To track user engagement, a series of user "milestones" were examined. The milestones were the percentage of users who had logged in a total of 4, 12, and 52 times after 12 months. Eighty-two percent of users had logged in at least four times by 12 months, 57% had logged in 12 times, and nearly a quarter of all users had averaged one login per week after 12 months.

Many people are watching the conversation. In a given month between 10% and 25% of users that logged in took a snapshot, made a comment, or posted to the expert forum. While those values are modest, the data suggest that the social features brought value to many more users on the site than just those that created social content. In a given month between 35% and 55% of users who logged in viewed social content, or about twice as many users as created social content. A scatter plot of user's creation of social content against their viewing of social content suggests that many users viewed social interactions without ever contributing to the online conversation. Another group that stands out is the small handful of users who created a large number of social posts without viewing others' posts. These users are most likely members that took frequent (often daily) snapshots to catalog what happened in their homes (See Figure 4).

Users are experts too, and great champions. Two distinct populations emerged that did much to maintain the level of engagement with the website. One group was referred to as *expert users*, and the other as *super users*. *Expert users* brought genuine energy expertise to the community. They did not typically contribute to the day to day discussions on the site, but when an interesting question arose they stepped in to share their expertise (see User 2 in Figure 2 for an example). Resident experts stood ready to contribute to any conversation, but typically let *expert users* take the lead to build their reputation and rapport with the community. This was done with the belief that support from a fellow user will be more trusted, and therefore be more persuasive, than if it came from the resident expert. Resident experts would step in if important information was missing or the direction of the conversation was not likely to bear fruit.

Super users were a small subset of extremely active users. They were not necessarily energy experts, but they brought energy to the website that kept the conversation moving. They posted their own experiences, engaged in conversations with other users, and generally acted as cheerleaders for the other users on the site. These users may have accounted for a disproportionate amount of the social activity on the website, but they served an invaluable function of engaging with other users, and keeping them involved.

Conclusions

Our experience demonstrates that a goal-based method with interactive tools that lead to participation can result in significant long-term savings. We have shown that utility customers will actively engage with utility sponsored, social and interactive web applications, and, in the process, they will become energy savings advocates and share expertise with each other. The usage data indicate that active on-line participation benefits the broader population of users beyond those active participants. The correlation of engagement with savings indicates that social interaction is an important component of successful web-based, energy feedback interventions.

Paul Cole, Psy. D. has over 20 years of experience applying behavioral science principles to technology development in industries ranging from education, energy to healthcare.

Kyle MacLaury has several years experience in the utility industry. His experience includes energy efficiency programs, customer engagement products and meter data management software.

William Surles has been researching energy efficiency challenges for 5 years. He has a masters in building energy science and 3 years experience as a product manager and data scientist.

Emily Weitkamp earned her PhD in Mechanical Engineering from Carnegie Mellon University in 2007. Since graduating she has been working in the private sector applying behavioral techniques to energy efficiency projects.

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Implementing Sustainability: the Behavioral-Institutional Dimension

By Elizabeth L. Malone, Rick Diamond, Amy K. Wolfe, Tom Sanquist, Christopher Payne, and Jerry Dion

Organizations, both public and private sector, are increasingly pursuing strategies to reduce their energy use and increase sustainability. Whether these efforts are based on economic rationale, community spirit, environmental ethics, federal mandates, or other reasons, they predominantly feature strategies that rely on new technologies. If there is any focus on behavior change, it is typically addressed to changing individual behavior. While we recognize the importance—and limitations—of the role of individual behavior in promoting sustainability goals, we are more interested in the role of institutional behavior. We have reviewed the small but growing literature on institutional behavior change, and have identified eight "evidence-based" principles as a guide for federal agencies to take action. This article presents the principles and illustrates them with examples to suggest ways that they can serve as models for others.

Changes in behavior, institutions and technology, working together, can transform the workplace into an energy-efficient and sustainable space – and, in the process, improve the way things are done, improve comfort and productivity, and save money and resources. This process is not, as some have claimed, easy or cheap, but it can result in significant and persistent change.

Federal agencies may already have woven sustainability into their missions or only just taken the first steps toward sustainable practices. Whatever the agency's starting position, sustainability is taking on new importance, as evidenced by the requirements of Executive Order 13514, *Federal Leadership in Environmental, Energy and Economic Performance*. But meeting the E.O.'s requirements is only one step in institutional change within federal agencies to make sustainability the way of doing business.

Sustainability is an inherently integrated concept, and strategies employed to achieve sustainability must also be integrated. Technological change certainly is an essential element, as are changed policies and procedures. But these strategies must be complemented by changed behaviors, both individual and institutional, at all levels. Beyond formal policies and procedures, the informal rules and shared assumptions of the group may need to change. The agency and its subgroups need to value sustainability and build it into the workplace, or desired changes may neither be realized nor persist. People have largely been treated as background players or as the objects of awareness or education campaigns, and not as integral elements of change. Our project group within the Federal Energy Management Program (FEMP) emphasizes people in focusing on individual and institutional change.

Certainly there is much to be learned about how to change individual and institutional behavior. But a developing body of research suggests a promising set of principles for how to design and implement energy efficiency and sustainability programs. These principles are not a magic formula for instigating or maintaining change, a "cookbook" for action, or interchangeable items. Rather, they are the evidence-based foundation for selecting strategies to adopt to meet specific energy-efficiency and sustainability goals within particular workplace contexts.

First we list the principles, then briefly discuss each and provide examples.

1. The Social Network and Communications Principle: Institutions and people change because they see or hear of others (individuals, groups, institutions, firms, etc.) behaving differently.

2. The Multiple Motivations Principle: Institutions and people almost always change their ways of doing things for more than one reason.

3. The Leadership Principle: Institutions and people change because the workplace rules change and visible leadership communicates management commitment.

4. The Commitment Principle: Institutions and people change when they have made definite commitments

to change, especially when those commitments relate to future conditions.

5. The Information and Feedback Principle: Institutions and people change because they receive actionable information and feedback.

6. The Infrastructure Principle: Institutions and people change because a changed infrastructure makes new behaviors easy and/or desirable.

7. The Social Empowerment Principle: Institutions and people who feel they can reach desirable social goals – often do.

8. The Continuous Change Principle: Institutional change takes time.

The Social Network and Communications Principle: Institutions and people change because they see or hear of others (individuals, groups, institutions, firms, etc.) behaving differently.

Description: In its institutional dimensions, this principle captures the observation that people bring their values, beliefs, and actions into line with those of others. We are social beings who behave in ways that are deeply, sometimes unconsciously, influenced by the expectations and actions of others. When conditions change, we take notice of what others are doing and often are led to similar actions. Social network researchers have found that you can lose weight or quit smoking if someone even two or three degrees separated from you (i.e., whom you don't know) accomplishes these goals. The same tendency to do what others do has been observed in organizations; they often structure themselves in the same ways and have similar "corporate trappings" such as visions and missions.

Practical Advice for Program Design and Implementation: In a nutshell, make sure staff see or hear about others who have changed their office settings or patterns of behavior. The implications of this principle for sustainability programs are that programs will be much more effective if they make visible throughout the institution that other institutions and people have adopted sustainability-relevant behaviors. What works: involving staff in the discussion of proposed changes, ensuring that managers and leaders model desired behaviors (see the Leadership Principle) and continuously relaying stories about others' successes.

Examples that Support this Principle: The U.S. Fish and Wildlife Service emphasizes personal contacts and meetings to communicate energy efficiency and water conservation practices that have spread throughout the agency. Energy monitors in the Navy's Region Southwest Metro San Diego Area (NRSMSD) used email messages and training to communicate the activities of the team – resulting in a 37% reduction of energy use between 1985 and 2005. In fiscal year 2011, the U.S. Air Force's Air Mobility Command saved more than 42 million gallons of aviation fuel through implementing ideas from a broad range of personnel.

The Multiple Motivations Principle: Institutions and people almost always change their ways of doing things for more than one reason.

Description: By themselves, sustainability goals may not get much traction in an organization. They may be seen as another unfunded mandate or "other duties as assigned" – unless there are other benefits to be gained along with meeting the sustainability goals. One benefit for groups and individuals might be that sustainability goals are extensions of or consonant with efforts they're already making, like buying fair trade coffee and Energy Star computers and appliances, seeking LEED certification for their new building, or riding bicycles to work. Other appeals that, alone or in combination, have been found to motivate people include the wish to "do the right thing," increase comfort, be healthy, set a good example for children, be cool/trendy, help the country innovate, work together on a project, even save money. However, people generally don't buy efficient stoves, hybrid cars, or low-carbon-input food because they are cheap. People choose such products because they're cool, fit a lifestyle, have features that appeal – and because friends or acquaintances have such products (a primary reason for many purchases – see the Social Networks and Communication Principle).

Practical Advice for Program Design and Implementation: At its heart, this principle suggests making different and combined appeals. Ask people – staff at all levels – why they might get involved in sustainability activities. When they identify other benefits, whether synergies or tradeoffs, incorporate them into program design and communications. Design appeals that relate to the agency's mission, workplace comfort, convenience, special features (such as dashboard-type information) outside of energy efficiency, exercise programs, trendiness, setting a good example, or just "doing the right thing." Appeal to various motivations, preferably in combination.

Examples that Support this Principle: Military housing residents at the U.S. Marine Corps Air Station in Yuma reduced energy use without economic incentives (residents don't pay utility bills), and said that they wanted to (1) do the right thing, (2) set an example for their children, (3) show that the Marine Corps was the best military service, and (4) have comfortable homes. The U.S. Fish and Wildlife Service connected energy and water conservation efforts to the existing cultural values of the numerous naturalists who work at the agency. And the Center for Disease Control captured a connection to the agency's mission in the slogan, "Get green – get healthy!"

The Leadership Principle: Institutions and people change because the workplace rules change and visible leadership communicates management commitment.

Description: Active leadership, from both managers and other staff members, sends workplace groups the signal that sustainability is something they need to pay attention to, rather than shrugging off what could be seen as a diversion from the "real" work of the agency. Beyond merely "approving" the effort, high-level, well-respected individuals should personally champion sustainability. The involvement of a high-ranking person demonstrates the importance of the effort, as well as a top-down commitment. If written or public commitments are asked for, leaders should be among the first to make such commitments (see the Commitment Principle).

Practical Advice for Program Design and Implementation: In short, be visible and demonstrate commitment. Show up and follow up to demonstrate that your agency and workplace are serious about sustainability. Supervisors at every level need to be brought on board and given the motivation and tools (technical assistance, funding, analysis time) to address identified issues; these are important institutional investments.

Examples from the Literature that Support this Principle: At the Centers for Disease Control, the Director led stair walks on the building's open stairwell. David Guthrie at the U.S. Fish and Wildlife Service is an award-winning leader who designed a comprehensive program of energy efficiency, including data collection, a new role of energy managers, and stretch goals. Leadership from the U.S. Postal Service's Postmaster General is evident in public statements and a streamed video on the Lean Green Team home page, where team formation is an explicit goal.

The Commitment Principle: Institutions and people change when they have made definite commitments to change, especially when those commitments relate to future conditions.

Description: People who make commitments to do something tend to have higher rates of follow-through and success than people who don't, regardless of their favorable attitudes. This finding is widespread across social science research. A common weight-loss recommendation is to tell friends you are going on a diet; this proclamation helps externalize your goals and increases the likelihood that you will realize them. Numerous studies have demonstrated this principle for energy efficient behaviors. Without pre-commitments, people tend to procrastinate.

Practical Advice for Program Design and Implementation: Ask for specific commitments. For example, at staff meetings where sustainability goals and activities are discussed, hand out cards with wording that both ties into the workplace culture and invites the staff members to define their own behavioral changes or goals. Sample wording for a workplace where teamwork is valued and peer relationships are strong could be, "With my co-workers, I will adopt the following practices:" followed by several blank lines. Potential shared goals should be discussed in the meeting. New staff members can be asked to sign a statement that he or she will join the office's effort to become more sustainable (along with specific goals as applicable).

Examples from the Literature that Support this Principle: At the Department of Energy, the "Commit to Efficiency" program encourages federal employees to join their peers in specifying purchases of "green" products. The U.S. Postal Service's Lean Green Teams commit to doing projects that have very specific goals, where progress can be tracked at every level. U.S. Fish and Wildlife Service commitment to a vision of a building that embraces environmental stewardship on land that is steeped in history became a reality in the Assabet River National Wildlife Refuge (Sudbury, Massachusetts).

The Information and Feedback Principle: Institutions and people change because they receive actionable information and feedback.

Description: Comparison and even competition can be powerful motivators, as shown in several current programs that provide real-time feedback (on the internet) or comparisons on utility bills. These programs lower energy use. "Actionable information" means the opposite of the usual laundry lists of generic actions; instead, items must be implementable in the actual workplaces where they are suggested. That is, people must be able to see themselves taking those actions; if not, the result will be discouragement at best, tuning out of the whole program at worst.

Practical Advice for Program Design and Implementation: Provide tools and resources tailored to specific workplace situations. Energy use and savings should be made visible, thus providing goals and motives where they did not previously exist. Calculating facility, group, or individual carbon footprints can be engaging, empowering (see the Social Empowerment Principle), and effective. Other actionable information should include only those activities that can be implemented in the specific situations of workplaces.

Federal Workplace Examples that Support this Principle: The Navy's regional energy management team in its Region Southwest Metro San Diego Area compiles data from an extensive network of steam, electric, and gas meters and distributes straightforward reports with actionable information. The Department of Energy's Waste Isolation Pilot Plant altered its procurement system to require purchasers to provide a rationale for purchase of a non-compliant product, thus providing immediate feedback to the buyer and aggregate feedback to procurement policymakers about overall purchasing practices. Fort Irwin initiated Operation Battle Blackout, a voluntary program to reduce electricity; the immediate feedback on reductions helped avoid $1.7 million in energy costs from June to September, 2009.

The Infrastructure Principle: Institutions and people change because a changed infrastructure makes new behaviors easy and/or desirable.

Description: How building space is configured and how choices are presented make huge differences in people's behavior – and therefore in aligning that behavior with technologies and policies aimed at achieving agency sustainability goals. Examples: By presenting the more sustainable vegetarian option first instead of second for a conference meal, the November 2009 Behavior, Energy, and Climate Change conference saw many more people choose the vegetarian meal. When a company provides benefits for public transport but not for parking, more people use public transportation. The "defaults" of the physical environment can also either promote or impede energy-saving behavior. Characteristics of the built environment (e.g., whether a city is walkable) and technology (e.g., whether programmable thermostats are intuitive to use) can have a significant effect on behavior. Indoors, building managers deploying "adaptive comfort" processes (e.g., widening the designed temperature acceptability range and giving occupants leeway to adapt) see lower energy demand, higher staff satisfaction, and easier operation. For new equipment choices, when the Danish government persuaded its window manufacturers to present low-e windows first in their marketing materials, sales of low-e windows shot up.

Practical Advice for Program Design and Implementation: Change defaults (indoor temperature, printer settings, walkability of halls and stairwells, provisions for parking, etc.) and offer motivations as well as incentives to use infrastructure differently (e.g., special status/benefits for van pool and public transportation users). Check that such changes are effective. For example, when changing the default settings for the heating and air conditioning system, be sure to consult staff and readjust as necessary to avoid counterproductive behaviors like individual space heaters or fans. If possible, allow staff to adjust settings, which often leads to lower energy use and empowers staff. Identify, with staff input, what features of a work-at-home program, carpooling or public transport incentives would facilitate adoption. Make a plan to change/upgrade lighting and appliances to be more energy efficient.

Examples from the Literature that Support this Principle: The U.S. National Park Service ensured that energy-efficiency projects were constantly in the pipeline, so that, when different funding mechanisms became available, the Regional Energy Manager could take advantage of them. In a university building, interventions, including prompts and enhanced aesthetics, visibility, and accessibility of the stairwell, resulted in an 8.2% increase in total stair use that continued over the 4-week post-intervention period. The Department of Energy's Pacific Northwest National Laboratory equipped soft drink machines with a Vending Mi$er® that cuts power consumption up to 60 percent (a suggestion from a staff member).

The Social Empowerment Principle: Institutions and people who feel they can reach desirable social goals – often do.

Description: Daniel Pink, in *Drive*, draws on various well-established social science research to show that workers are not motivated by sticks and carrots but by three desires: autonomy, (people want to have control over their work), mastery (people want to get better at what they do), and purpose (people want to be part of something that is bigger than they are). Appealing to these motivations will be far more effective than putting in place rules and sanctions and/or prizes for the best energy-efficient or sustainability performance.

Practical Advice for Program Design and Implementation: Involve people in program design and processes. Identify which categories of people are essential to program success and consult with them throughout program design and implementation processes.

Examples that Support this Principle: U.S. Postal Service's Lean Green Team projects deliberately are planned with no or limited resources – so the teams know they can move forward and implement them. The Marine Corps Air Station at Beaufort created a "can-do" working group that includes all energy stakeholders, such as building occupants, site planners, maintenance staff, architects, and engineers to develop energy conservation goals and strategies. The monitoring and evaluation process for the Air Force's Air Mobility Command includes air crews, planners, maintainers, and logisticians.

The Continuous Change Principle: Institutional change takes time.

Description: The organizational change literature emphasizes that change management efforts often fail because the change is not sustained. The key to achieving and sustaining significant change is altering the basic ways of thinking within the organization, something that is difficult to achieve and sustain; a shift to sustainability values and practices might not rise to the "major transformative" level, but it must be considered a multi-year process. Changes should be "baked into" the organization so that, over time, sustainability is integrated into formal and informal standard operating procedures.

Practical Advice for Program Design and Implementation: Plan from the beginning for a multi-year process, with activities that can be implemented now and others that are planned for the coming years (kick-off events *plus* follow-on activities; sustainability training for current employees *plus* as standardized components of new employee orientations). Seek staff input at regular intervals about what they are doing and how to increase sustainability.

Examples from the Literature that Support this Principle: The U.S. Marine Corps Beaufort's standard operating procedure

now requires facility architects and engineers to address energy efficiency in all facility designs and specifications. The U.S. Air Force's Air Mobility Command has built in the process of continuously seeking fuel-saving ideas by creating a governance structure and tying it to the existing corporate structure. The Department of Energy Waste Isolation Pilot Plant has institutionalized its sustainability program in an Environmental Management System.

Conclusions

Efforts to build sustainability will succeed only to the degree that agencies and others adopt strategies that integrate technology and institutional changes, especially in programs to reduce energy use. Our review of the literature has shown that efficient and sustainable institutional and individual behaviors persist in organizations when they are supported by the culture and infrastructure of those organizations. These principles provide an approach, not a checklist, for agencies to develop a process that ensures the goals of sustainability become a part of the fabric of their agency's mission, work, and everyday activities. Unless energy efficiency and sustainability are "the way we do business," they are at risk of being short-lived and ineffective.

For more information on these principles and the work of the FEMP Institutional Change Team to sustainable institutional change, see https://sites.google.com/a/lbl.gov/institutional-sustainability--public-site/home.

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Refrigerator Brushes and Rope Caulk . . . How Pete Street™ is using simple tools and techniques to save big $ for households

PETE STREET™

Where Neighbors Get Energy Savings™

By Dan Curry
Deputy Director for Programs
Clean Energy Durham

In a growing number of communities in North Carolina and beyond, a new peer-to-peer energy savings program is using puddles of refrigerator lint and today's useful equivalent of silly putty to get residents excited about saving big chunks of energy and money on their home utility bills.

Overview of Pete Street

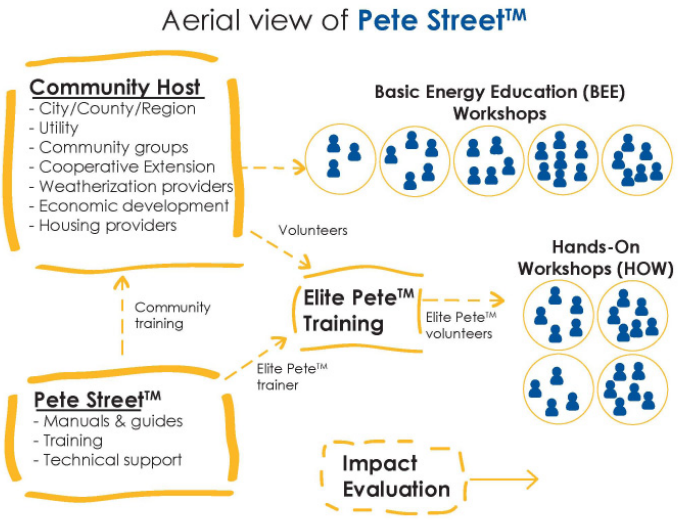
Called Pete Street, this energy savings education program has been developed by Clean Energy Durham, a non-profit started five years ago in Durham NC. Pete is that guy or gal down the street that knows something about saving energy in the home and is willing to share that knowledge with a neighbor.

Using a refrigerator brush to clean energy-robbing dust from refrigerator coils.

Judy Kincaid, a founder and the organization's executive director until her retirement at the end of 2012, believed there was a gap that needed to be filled in the country's approach to home energy efficiency. While federal, state and local programs have focused mostly on how to build a robust industry around contractor-delivered energy upgrades, Kincaid wanted to focus on what residents could do themselves using the simplest of tools and techniques. Using a ***Learn, Do, Teach*** approach, neighbors attend a workshop together, ***learn*** energy saving techniques, go home and ***do*** the techniques they learned, and then ***teach*** other neighbors. An intended result of this approach is that neighborhoods become stronger as they experience success in organizing, learning from each other, and supporting each other.

Pete Street is the result of five years of testing and refinement using Durham neighborhoods as the proving grounds. The basics of the approach are simple. Enlist one or more community organizations to coordinate the program. Engage and train

Rope caulk – an easy-to-use air sealing material that requires no tools and little instruction to install during a Hands-On Workshop.



The Pete Street program is ideally made available to an entire community (city, county, utility service area, etc.) through a licensing agreement that provides downloadable access to a full set of training manuals and guides and close to 100 document templates that can be customized for local use. Basic Energy Education Workshops can be underway in a community within several weeks of program launch.

a core group of dedicated community volunteers on simple, do-it-yourself energy savings techniques. Invite residents to attend small group workshops led by the trained volunteers in neighborhood homes and community facilities. And follow-up with residents after they attend a workshop to see what energy savings projects and behaviors have resulted.

Something must be on target with this approach. Since Clean Energy Durham started marketing its program in mid-2012 for use outside of Durham and with a pilot program location in Warren County, NC other NC locations have signed up. Pete Street sign-ups include Siler City, Wilson, Chapel Hill, Carrboro, and Greensboro. In February of 2013, Orange County, Florida (including Orlando) became the first community on Pete Street outside of NC.

Going Viral with Basic Energy Education (BEE) Workshops

Pete Street is based on the premise that every household should have an opportunity to participate in saving energy and money. While many programs require a fee or cost-share for participation, the idea behind Pete Street is to invite every household to come to free workshops where residents can learn simple no-cost or low-cost ways they can make energy savings an everyday part of their lives.

Taking the approach that volunteers are in the best position to engage with their neighbors, Pete Street has created a set of workshops and volunteer training programs designed to be fun, educational, and available to all.

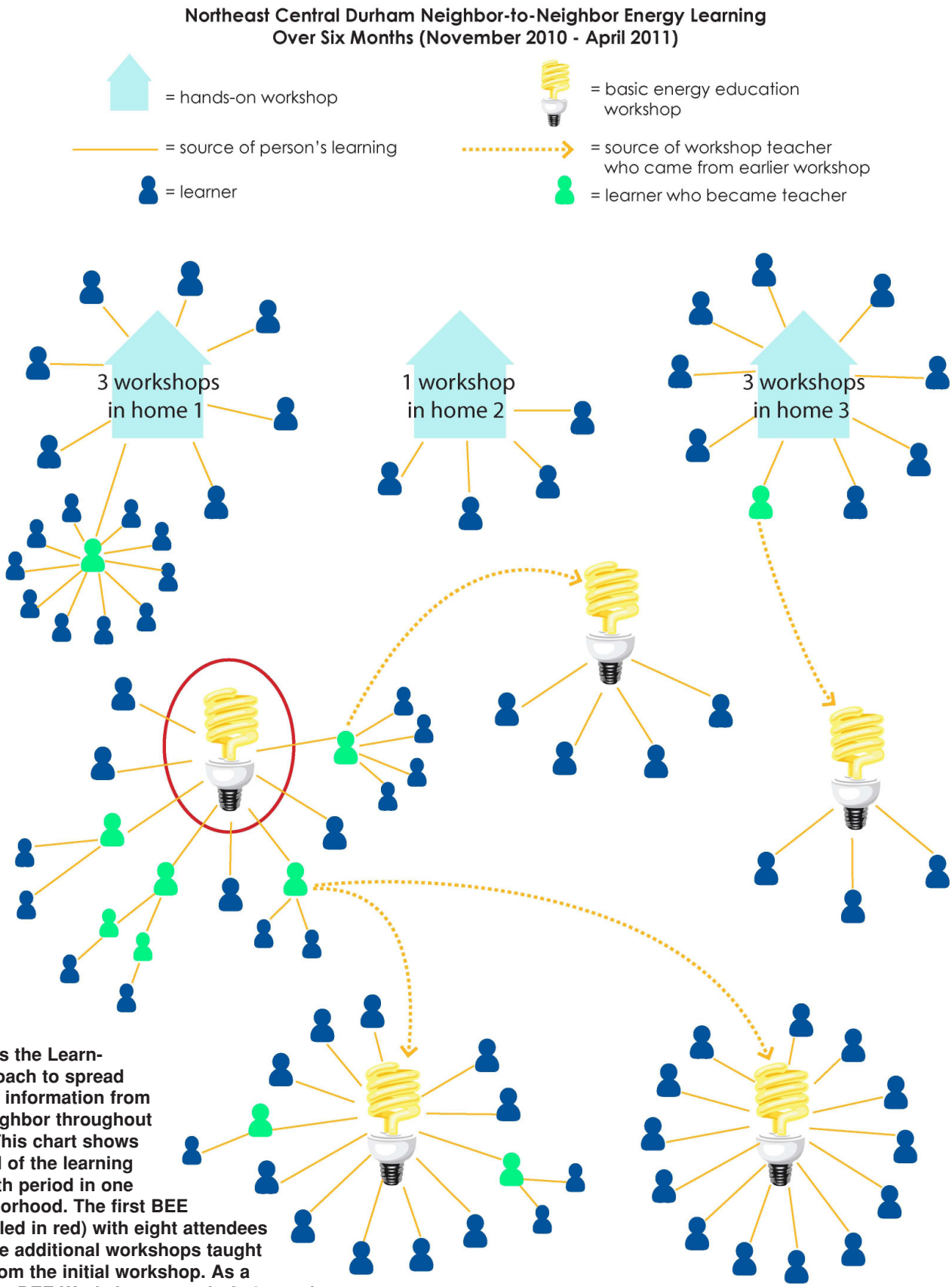
The Basic Energy Education or "BEE" Workshop is a one-hour workshop designed to introduce residents to saving energy by changing behavior, with minimal commitment and only one hour of time. Volunteers who have attended a BEE Workshop become the next round of BEE hosts and leaders using an easy-to-follow Leader's Guide. Many residents leave a BEE Workshop enthused and eager to lead BEEs in their own home or community meeting space. To reinforce the learning process, a fun and engaging game of Energy Bingo is a part of every BEE Workshop.

"It was very interesting to teach the BEE because everyone at each workshop found the information interesting and I really liked that the participants involved themselves in the questions and answers. Most people found it interesting that there was so much information that they did not know about energy savings. Bingo was lots of fun and everyone was very interested in the game and Bingo was another way of learning the different ways to save energy." Sinatra Kitt, Durham NC BEE Workshop volunteer leader.

As an introductory activity, BEE Workshops are easy to set up and run, and that means they can be happening within a few weeks after a community starts a Pete Street program. BEEs can also be happening while other volunteers are in training for conducting the more detailed Hands-On Workshops. Because anyone can lead a BEE Workshop, they also lead to quick spread of energy savings information throughout the community. The viral chart shows the six-month impact of a series of workshops in the Northeast Central Durham neighborhood. At the end of the six-month period, one BEE workshop with eight attendees had resulted in a total of 52 people learning about saving energy in their homes. One of those persons attending the first BEE workshop in East Durham was Gloria Hewitt. *"Because of the workshop, I would say I saved every bit of $80-$100 a month! I switched the light bulbs, cleaned under the refrigerator, unplug things when I'm not using them, and do all the other things I learned. I went on to teach my daughter and some of my neighbors, so they could save, too."*

Hands-On (HOW) Workshops

Hands-On Workshops take energy education to the next level and appeal to many aspects of adult learning, namely that the learning is relevant and it is delivered in a way that is interesting and interactive. Pete Street teaches 17 simple projects that folks can do around their own home. Of the 17 projects, around 15 can also usually be done by renters, although that depends on the lease and the landlord- tenant relationship. (It is hard to imagine a landlord objecting to CFL light bulbs. Other projects, like low flow faucet aerators or a door sweep, may technically be outside of a renter's rights under the lease without landlord permission.) The projects range from electrical outlet insulators to the proper techniques of weather-stripping a door to installation of low-flow faucet aerators and showerheads that reduce the amount of hot water used in the home. The 17 projects were selected because



Pete Street uses the Learn-Do-Teach approach to spread energy savings information from neighbor to neighbor throughout a community. This chart shows the viral spread of the learning over a six-month period in one Durham neighborhood. The first BEE Workshop (circled in red) with eight attendees resulted in three additional workshops taught by attendees from the initial workshop. As a result of the first BEE Workshop, a total of 52 people learned about simple ways to save energy around their homes.

Energy Bingo is a fun and engaging part of each Basic Energy Education Workshop.

they require simple hand tools, are inexpensive (usually under $50 to implement three or four of them during a workshop), and can be taught and tried by the participants in under 30 minutes for each project.

At each 90 minute Hands-On Workshop participants get a chance to learn and try three to four of these energy saving projects under the guidance of an Elite Pete™ volunteer. An Elite Pete is a community volunteer interested in helping residents save energy and is willing to make a commitment of time to learn and then run Hands-On Workshops. Each Elite Pete participates in a 15-hour training program run by the community host agency followed by one or two apprenticeship sessions at actual Hands-On Workshops where they are given the chance to run portions of the workshop alongside an experienced trainer. The Elite Pete volunteers become the public face of the Pete Street program and finding and training these volunteers is a core component of the program. Volunteers not only learn how to save energy and money in their own homes but most indicate the biggest benefit is the feeling that they are helping their neighbors and strengthening their own community.

Pete Street™ Hands-On Workshop Projects
1. Cleaning refrigerator coils
2. Install outlet/switch insulators
3. Caulk air leaks – heating/cooling vents
4. Caulk air leaks – plumbing
5. Caulk air leaks – windows & doors
6. Caulk air leaks – floors, walls & ceilings
7. Install reusable heating/cooling filter
8. Install door weatherstripping/door sweep
9. Install attic stairs/hatch weatherstripping
10. Clean & unkink dryer vent
11. Insulate pipes near water heater
12. Install insulating water heater wrap
13. Install CFL and/or LED bulbs
14. Put up window film
15. Install low-flow faucet aerators & showerheads
16. Install programmable thermostat
17. Use power strips for computers & electronics

Hands-On Workshops are ideally conducted in private homes or apartments and the hosts receive the benefit of getting energy savings projects done on their home by the Elite Pete volunteers attending that particular workshop. Communities can choose how to cover the cost (usually under $50) for the supplies needed for each workshop. Some ask the host to pay for the supplies; others use funds secured from sponsors or other program or grant funds. In instances where the host cannot purchase the needed supplies, the Elite Pete can select a group of projects that do not require the purchase of any supplies. **There are virtually no cost barriers to participation in the Pete Street program!**

Case Study – Pete Street delivers energy savings to Halifax Electric Membership Corp. customers in Warren County NC

In Clean Energy Durham's first energy education partnership outside of Durham NC, the organization partnered with Halifax Electric Membership Corporation, a rural electric cooperative in northeastern NC. Charles Guerry, Executive VP and General Manager with Halifax EMC clearly stated the reason they wanted to engage in this partnership. *"In our business, the people who are buying the most electricity are usually the lowest incomes – they have poorly insulated houses, they have little energy knowledge, they have old appliances, etc. You sit across the table from people who have little income and they are struggling and they have a $400 bill and you scratch your head about what you can do for them."*

Through this partnership, energy savings workshops were conducted from the fall of 2011 through spring 2012. Following the workshops, the University of North Carolina Environmental Finance Center (EFC) received electrical billing information from Halifax EMC that allowed for the comparison of electricity use between households that attended energy savings workshops and those that did not attend any workshop. The report published in July 2012 by the EFC[1] made three primary findings:

1. Individuals who chose to participate in one of the Pete Street workshops had 20% greater electricity consumption, on average, than the typical Halifax EMC customer prior to attending the workshops.

2. Preliminary statistical analysis reveals a 7.5% reduction in monthly electricity use for workshop participants, relative to households who did not participate in a workshop. This translates to an avoided energy expenditure of roughly $13 per month, on average, that can be attributed to workshop attendance.

3. Households with an individual who participated in one or more advanced Hands-On Workshops exhib-

Hands-On Workshop participants prepare to install a washable, reusable HVAC filter.

ited the greatest relative reduction in monthly electricity use, using 17.5% less electricity per month that the non-workshop households, though the small sample size limits the breath of interpretation of this result.

The partnership with Halifax EMC in Warren Co NC was made possible through funding support from Z. Smith Reynolds Foundation. The process started with the training of eight community volunteers who completed the eighteen hour Elite Pete training program (they were just called "energy volunteers" in this case). This diverse group of eight volunteers included an equal split of 4 men and 4 women. Two were members of the Haliwa-Saponi tribe that participated extensively in the energy savings program. Once the energy volunteers completed their training, they joined the Clean Energy Durham staff in conducting 11 energy savings workshops with more than 100 participants.

Local businesses also got interested in the energy savings program and four local Ace and True Value hardware stores contributed tools and supplies as well as 10% cash register discounts for workshop participants who brought their workshop attendance certificates with them to purchase energy saving supplies. Halifax EMC kicked in an additional 25% rebate on the first $100 of energy saving supplies purchased.

At first, the program was slow to catch on. Clean Energy Durham's model of using existing neighborhood connections did not work as well in the more rural Warren County where the next "neighbor" might be a mile down the road. However, once

Elite Pete volunteer graduation in Warren County NC.

local connections were made, such as with the local Haliwa-Saponi tribe, participation increased. While over 100 individuals attended some type of workshop, the EFC was only able to match up 43 households with the billing information from Halifax EMC. This was due to some households being served by other electricity providers, and some households attended too late in the program to make the analysis of a full winter peak heating season possible.

The full UNC Environmental Finance Center report is available on their website at http://www.efc.unc.edu/publications. Two commonly used analytical methods were used to determine the effects of program participation. A difference-in-change approach was adopted to compare the average consumption levels before and after a household attended a workshop. To avoid biases from confounding effects such as a warmer-than-average winter and other household electricity use changes, a difference-in-difference regression methodology was also applied to estimate a "treatment effect" of the workshop.

Type of Workshop	Treatment Effect
Hands-On Workshop (HOW)	-17.5%
Basic Energy Education (BEE) Workshop	-3.9%
Energy Volunteers	.3%
Average all attendees	**-7.5%**

Charles Guerry was pleased with the results of the effort. *"The reporting model (EFC report) that was given to them was very good. It surprised us at how much savings was out there. I would have expected a third of the savings. 7 percent looked great and 17 percent was outstanding! . . . I am extremely eager to see this move to serve all of our members."*

One of the next steps according to Guerry needs to be getting approval from the NC Utilities Commission to use some additional funding to continue and expand the program. *"Once the program is approved by the Commission, its very easy for another group to pick it up "* says Guerry who wants to work with Clean Energy Durham and others to place the program in front of the Commission in early 2013.

Neighbors teaching each other how to use a power cost monitor.

Building demand for other energy-savings programs

The American Recovery and Reinvestment Act (ARRA) has resulted in an array of new or expanded energy efficiency programs in communities nationwide. The sustainability of these programs after ARRA funding ends later this year varies depending on how the programs were structured and the level of local support.

The Pete Street approach of engaging and training local volunteers to deliver energy savings education is ideally suited to work in concert with a communities retrofit and weatherization programs to build demand for those services. In Durham, the Sustainability Office contracted with Clean Energy Durham for outreach services for their DOE and EPA-funded retrofit program. Clean Energy Durham used the neighbor-to-neighbor approach to enlist over 700 households to apply for the City's program and also offered energy education workshops to all participating households to further reinforce energy use behavior changes. Follow-up surveys are still underway to measure the additional impact of this educational effort but preliminary results indicate that the energy workshops are resulting in an increase in the number of behavior changes and home upgrades being made by workshop attendees.

In early 2013, two additional research triangle area communities, Chapel Hill and Carrboro adopted the Pete Street program to enhance their ARRA-funded retrofit programs. Both towns are looking to engage more households, particularly lower wealth households and neighborhoods that have not seen a lot of retrofit activity.

In Greensboro, NC, a piedmont triad community of 280,000, the Greensboro Housing Coalition has recently purchased a Pete Street license and is planning to start in five neighborhoods that are already engaged in the City's BetterBuildings energy retrofit program. But the real interest at the Housing Coalition is in looking to team up the Pete Street approach with their nationally recognized Healthy Homes Initiative supported by the Kresge Foundation and Citgo.

The linkages between healthy homes and energy efficiency are obvious. Minimizing unintended airflow in and out of homes can improve air quality and reduce moisture penetration, which is the primary source of mold and mildew, conditions associated with asthma. Using the Pete Street neighbor-to-neighbor model to reach low-income families will give the Housing Coalition another way to gain a foothold with households that have traditionally been hard to reach. And with the Pete Street approach of engaging trained volunteers, the Housing Coalition believes they can scale up their program to a level that will have a real impact on community health levels citywide. *"This program will be a great compliment to our healthy homes initiative. Studies show that people prefer to learn from their friends and neighbors, rather than a county entity or a utility. Behavior change is also more likely to occur and stick, when people learn from their peers"* says Beth McKee-Huger, Executive Director at the Greensboro Housing Coalition.

Tracking Impact

Pete Street relies on two methods to track results and impact. One is through a process of recording information from attendance sign-in sheets at educational workshops and then following up with those attendees two to three weeks afterwards. During this follow-up survey, information is requested about what energy-savings projects they have done and how many of their neighbors and friends they have taught. With this information, an estimate can be made (called deemed savings) based on researched findings about how much energy should be saved for each project done. For example, if attendees went home and replaced their standard water tap fixtures with faucet aerators and a low-flow showerhead, it can be estimated that an energy savings of approximately 4% should be achieved due to less hot water being used.

While deemed savings can give you an estimated energy savings amount, this approach does not replace the need for direct measurement of energy use changes. Indeed, further regulatory approvals and adoptions by communities and utilities will depend on solid energy use analysis similar to the EFC study of the Pete Street program in Warren County, NC. It is important to build this capability on the front end of an energy efficiency program so that it is well understood by all parties and so that acceptable release forms and data formats are available. A sufficient time period is also needed, preferably at least a full year of data following participation, along with one to two years of pre-attendance data to establish baselines.

Getting on Pete Street

Becoming a Pete Street community is not difficult or expensive. A license to use the Pete Street suite of leader's guides,

Using a simple display board to teach how homes use and lose energy.

training manuals, and close to 100 pre-built forms, templates, flyers, and other program documents is based on community size with current pricing ranging from $2,500 to $10,000. Many communities also purchase one or several customized training services to help with program planning and launch. However, the program materials provided with the license purchase provide everything that a local program manager would need to get started.

Pete Street is meant to be a locally-based and delivered program serving all of a community's residents. The hosting agency can be a local government, utility, or community-serving organization. On the ground "ownership" of the program is an essential ingredient to success. Staff can provide train-the-trainer training or help with program management to accelerate implementation, but on the ground champions are essential to success. Organizations primarily serving low wealth families are particularly well focused to participate given the money savings and health benefits that can be achieved with simple energy efficiency activities. These have included local community development corporations, economic development entities, weatherization providers, and affordable housing providers like Habitat for Humanity. Traditional environmental organizations and environmentally concerned citizens are also key allies. While the Pete Street program focuses on energy savings and financial savings, it does not exclude partnership with other people and organizations with more traditional environmental focuses.

Conclusions and Lessons Learned

Clearly, energy savings are being achieved through basic energy education programs such as Pete Street. Since the marketing launch in 2012, Pete Street has been adopted by six additional communities representing more than 1.5 million households. Over the next 12 to 18 months substantial additional impact data will be generated about how effective this peer-to-peer education program is at affecting energy use behavior changes and the completion of simple energy savings projects around the home.

The body of evidence being assembled about behavior-based energy efficiency programs like Pete Street should lead to better understanding and acceptance of these approaches at the regulatory and programmatic level. There are some challenges to be addressed, including:

1. An era of shrinking resources. Conclusion of the ARRA funding stream and looming budget shortfalls at all levels make it unlikely that local governments will be in a position to start entirely new programs. However, programs like Pete Street may fill a critical niche where current EE programs are looking for ways to work more efficiently while still scaling up to meet community-adopted goals for energy efficiency and green-house-gas reduction.

2. Inconsistent access to utility data. Having access to before-treatment and after-treatment utility billing data is a critical element of an energy education program. Unlike a retrofit or weatherization program where test-in and test-out procedures can verify the effectiveness of an intervention, measuring behavior change and the impact of an energy education program requires more follow-up analysis to determine what changes have taken place and how they are impacting utility bills. Even with fully signed release forms, Clean Energy Durham has not always been able to glean energy use data from utility providers or the data has taken inordinate amounts of effort to obtain. Having a good relationship and clear process for requesting utility use information from local utility providers is needed.

3. Uncertain climate for utility commission recognition. Local utility providers are taking big steps forward in their energy efficiency incentives and even more will be possible if they have the ability and flexibility to cost-share with rate payers the cost of offering more behavior-based energy education programming to their customers. North Carolina established the current Renewable Energy Portfolio Standard (REPS) law in 2007. Under this provision, investor-owned utilities must provide at least 12.5% of 2020 electricity sales from renewable energy resources (including energy efficiency). The comparable goal for municipal utilities and electrical cooperatives is 10% by 2018. So while the overall goal is in place in NC and several other states, regulatory approvals are still required to enable specific programs. Behavior-based energy efficiency programs are lacking enough evidence-based analysis of their impact and too few programs have received approval to impact the overall REPS goal.

4. Double Tasking. While shrinking resources, data availability and Utility Commission support are common challenges with many other EE programs, Pete Street offers a potential solution. By achieving multiple goals around energy efficiency and economic empowerment, the program helps communities address the never more salient question of "How can we do more with what we have or with less?" For example, a community can purchase a license to Pete Street with federal dollars and then partner with local stakeholders around implementation, either going it alone or purchasing some train-the-trainer or program management services with other resources.

Neighborhoods become friendlier and safer when neighbors learn together how to save energy.

The community can link energy efficiency, community building, and economic development stakeholders with Pete Street and add other funded programs such as Healthy Homes. Finally, with the Pete Street manuals in hand, a community can use the local "energy" of enthusiastic partners to fill the financial gaps that "a more favorable policy environment" may provide.

5. Geographic and Economic Diversity or dispersal. A definite community and governmental advantage of Pete Street is that it is truly a whole community program with very low to non-existent barriers to participation. EE programs have traditionally only benefited specific income levels: energy bill subsidies and weatherization for low income households and partial retrofit reimbursement or tax credit driven projects for higher income households. The Pete Street model has the advantage of offering something for everyone and, even when offered in connection with more traditional programs, helps increase geographic and economic dispersal within a community.

The Pete Street model is a unique evidence-based approach to energy efficiency education. It is available to all residents in a community that adopts the program and is particularly effective in engaging low wealth households that are not participating in other energy efficiency incentives. Local organizers design each Pete Street program to meet the needs and opportunities of each local community and programs launch quickly because of the well-documented guides, training manuals, and instructional materials that come with each Pete Street license.

For further information about Pete Street, visit http://www.petestreet.org/.

Dan Curry received a B.A. degree in Environmental Design and Landscape Architecture from North Carolina State University. His career spans five decades of public and private sector work and has been focused on creating sustainable and high quality neighborhoods and communities. In his current position with Clean Energy Durham, he is working to advance the awareness and value of behavior-based energy efficiency education programs such as Pete Street by networking with community leaders, community development organizations, utilities, and program implementation agencies across North Carolina and nationwide.

Pete Street™ and Elite Pete™ are trademarks of Clean Energy Durham.

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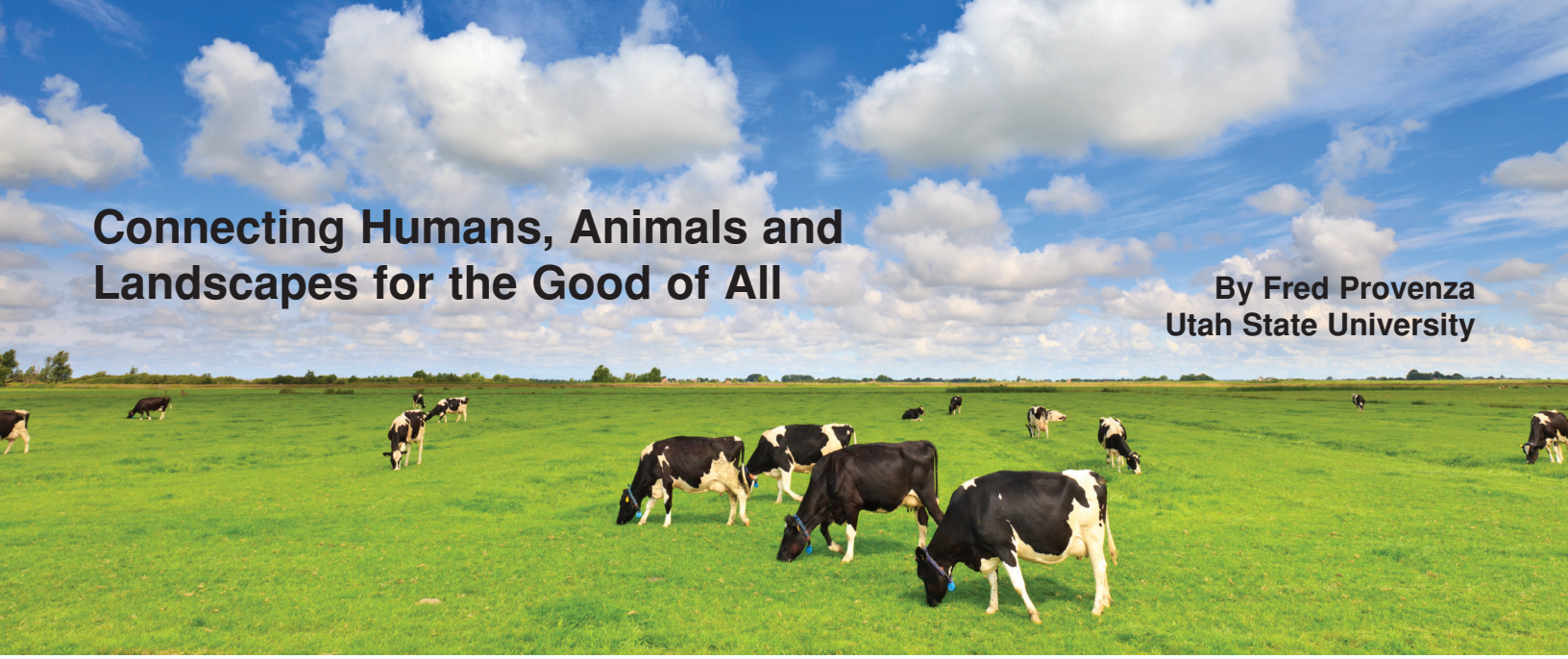

Connecting Humans, Animals and Landscapes for the Good of All

By Fred Provenza
Utah State University

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect." –Aldo Leopold, *A Sand County Almanac*

Leopold points out that while the ax, the cow, and the plow can devastate landscapes, those same tools can also rejuvenate land. In so doing, we can become what I call ecological doctors, people who understand the ties that bind all living things – animals, plants, and people – and who work to generate healthy soil, plants, herbivores, and people.

Ecological doctors can practice through Locally Adapted Networks (LANs) such as BEHAVE (behave.net), which bring together environmental and behavioral researchers and natural resource managers to create a dialog that fosters innovation. Learning how managers cope with challenges inspires scientists to think creatively about research. In turn, learning about behavioral principles and processes inspires managers to fashion innovative practices. In LANs, everyone is a student developing philosophies and practices that can bring about worthwhile changes, as illustrated in the following examples:

From Fences as Livestock-Sitters to Shepherding

In the United States we've come to rely on fences to influence the foraging behavior of livestock. Compared with "hi-tech" apparatuses in livestock and land management, the practices of shepherds may seem primative. Nonetheless, with growing concerns over the high costs and consequences of technology, shepherding instead represents a sophisticated way to manage livestock and in turn the health of soil and plants, herbivores and people.

Fences can't do what a knowledgeable shepherd can do to optimize grazing from a diversity of forages. By designing daily grazing circuits, shepherds move livestock across terrain from meal to meal in ways that stimulate appetite, thus improving the nutrition, health, welfare, and production of animals. By knowing which plants work best as appetizers, main courses, and desserts, a shepherd can maintain plant diversity by encouraging the flock to eat a mix of plants, some palatable and others less palatable.

By far the highest level of sophistication in targeted grazing of weeds can be achieved through the relationship of a herder, a flock, and a landscape of "desirable" and "undesirable" species. The United States has more herbicide-resistant weeds (nearly 125 species) than any other place in the world. People spend over $120 billion annually in a never-ending, largely unsuccessful attempt to control weeds. Instead of trying to kill them with herbicides, we should be using herbivores to "love them to death."

Using Livestock to Rejuvinate Sagebrush-Steppe

Sagebrush steppe covers millions of acres of the West. During the past century, people attempted to eliminate sagebrush (*Artemisia tridentata* spp. Nutt.) and stimulate growth of herbs to suit presumed needs of wild and domestic animals. Contrary to long-standing beliefs, removing sagebrush has little value for communities, and people now realize the multiple benefits of sagebrush for the integrity of soil, plants, animals, and people.

Fire suppression and spring grazing by livestock has increased the *density of sagebrush* at the expense of other forages. In contrast to costly chemical and mechanical treatments or prescribed fire, integrating livestock grazing back into landscapes is a way to fashion systems of management in which locally adapted animals rejuvinate sagebrush steppe. Using sagebrush as forage enables ranchers to greatly cut winter feed costs, enhances the growth of herbs in spring, and maintains sagebrush as part of biodiversity.

Our goals are to create mosaics of habitat that meet needs of diverse species of plants and animals in soil and across landscapes and to fashion locally adapted systems of management with small carbon footprints. Three factors help livestock rejuvenate sagebrush steppe (Petersen et al. 2013). Providing supplemental energy and protein enables livestock to detoxify potentially toxic compounds (terpenes) in sagebrush. In addition, experience enables animals to adapt morphologically, physiologically, and behaviorally: animals exposed to sagebrush in

utero, early in life, or as adults consistently eat more sagebrush and maintain better body weights than their naive counterparts. Finally, livestock grazing at high stock densities can rejuvenate plant communities through foraging, physical effects, and nutrient inputs to soil, all of which can improve plant species abundance and diversity, increase soil organic matter and nutrients, moderate soil temperature, and enhance water infiltration rates. In combination, these effects can help to fix carbon in soil, mitigating levels of atmospheric carbon dioxide (Savory, 2013).

Changing the Culinary Culture of Cows

During the past century, people came to accept that cattle degrade riverbank ecosystems, and that nothing short of removing cattle or fencing riparian areas could rectify the situation. But fences as cow-sitters are expensive to build and maintain and they adversely affect many wild species of birds and mammals.

Alternatively, a rider on horseback can train cows and calves to forage on upland plants, and discourage their use of riparian areas by moving and placing them in desired locations. A rider can also identify and cull cows and calves that refuse to leave riverbanks. In doing so, people can change the culture of the herd, which is then maintained as calves learn from their mothers what to eat and where to forage.

Bob Budd trained cattle to use uplands, thereby improving riparian habitats for wildlife on The Nature Conservancy's Red Canyon Ranch near Lander, Wyoming (Provenza 2003). As he points out, riding is less costly than fencing and more effective in the long run. The costs of riding are offset by the benefits from additional forage in uplands, improved herd care and health, better riparian areas, and enhanced diversity of plants and wildlife.

Changing the Culture of Hay-Reliant Elk

Wildlife managers have fed elk for years to compensate for a shortage of natural winter range, to reduce depredation of hay stored for livestock, and to boost elk numbers. In contrast to these benefits, providing hay is costly, elk on feeding grounds have a higher risk of contracting and transmitting diseases such as brucellosis, and supplemented elk can compete for browse with mule deer, pronghorn, and greater sage grouse.

In 2004, we initiated a program to change the culture of elk living at Deseret Land & Livestock (DLL) in north-eastern Utah. Prior to 2004, DLL fed 1,000 elk annually for 20 years. While DLL generated significant revenue from hunting elk, they also spent roughly $70,000 annually on hay to prevent elk from depredating forage on adjoining ranches.

We used carrots and sticks to redistribute elk to desired areas. The carrots included strategic grazing by cattle in summer to create combinations of nutritious re-growth and mature forage that attract elk in winter, and supplemental energy and protein to enable elk to use sagebrush. The sticks included using stockmanship (ManagingWholes.com) to move and place elk in desired areas, and hunting to decrease use of areas we didn't want them.

Since the project was initiated in 2004, elk have been fed in only two winters—the first winter when we implemented the program and a winter when all forages were buried under snow and ice. Currently, eight cohorts of elk have limited or no experience being fed hay. Not surprisingly, elk now must be encouraged to use hay when they are fed. As with cattle use of riparian areas, we changed the culture of the herd, which is maintained as calves learn from their mothers what to eat and where to forage.

These examples are from the United States, but LANs are improving communities in countries as diverse as Canada, France, Israel, Botswana, South Africa, and Australia. When people who understand behavior want to learn from and work with those who manage livestock and natural environments, LANs can have a tremendous impact on the planet.

This article is based on an invited address at the Association for Behavior Analysis International's 2012 Behavior Change for a Sustainable World reprinted from Inside Behavior Analysis Volume 5(1).

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Fostering Sustainable Behavior[1]

By Doug McKenzie-Mohr, PhD

Introduction

The cornerstone of sustainability is behavior change. Sustainability requires that we tackle diverse goals, such as increasing water and energy efficiency, protecting water quality and biodiversity, reducing waste, and altering transportation choices. If we are to hasten the transition to a sustainable future, we must encourage the adoption of a wide array of behaviors that support these goals. To date, most initiatives to foster sustainable behavior have relied primarily upon large-scale information campaigns that use education and/or advertising to encourage the adoption of sustainable actions. While education and advertising can be effective in creating awareness and in changing attitudes, numerous studies document that behavior change rarely occurs as a result of simply providing information as information alone cannot address the diversity of barriers that exist for most sustainable behaviors (Environment Canada, 2006; Geller, 1981; Geller, Erickson, & Buttram, 1983; Jordan, Hungerford & Tomera, 1986; Midden, 1983; Schultz, 2002; Tedeschi, Cann & Siegfried, 1982). In contrast, community-based social marketing has been demonstrated to be an attractive alternative to information-intensive campaigns for the design of programs to foster sustainable behavior (McKenzie-Mohr & Smith, 1999; McKenzie-Mohr, 2010). Thousands of programs are now using this methodology and often with remarkable results. To learn more about community-based social marketing read *Fostering sustainable behavior: An introduction to community-based social marketing* (McKenzie-Mohr, 2011). Also visit the community-based social marketing website (cbsm.com) where you can find articles, case studies and discussion forums related to fostering sustainable behavior.

Community-based social marketing is based upon research in the social sciences that demonstrates that behavior change is often most effectively achieved through initiatives delivered at the community level that focus on removing barriers to an activity while simultaneously enhancing the activity's benefits. Community-based social marketing merges knowledge from the social sciences with knowledge from the field of social marketing (see, for example, Andreasen, 2006; Kotler and Lee, 2008). It borrows from social marketing an emphasis on understanding what impedes and motivates a target audience to act as well as the importance of piloting programs prior to their broad scale implementation. Social marketing has been used for several decades primarily to promote behavioral changes that improve public health and prevent injuries. From the social sciences, and particularly social and environmental psychology, community-based social marketing inherits a variety of behavior-change "tools" that can be used to foster changes in behavior.

Community-based social marketing involves five steps:

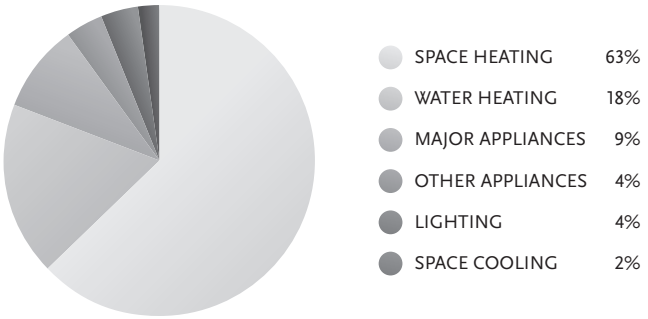
1. Selecting which behavior to target;
2. Identifying the barriers and benefits to the selected behavior;
3. Developing a strategy that reduces barriers to the behavior to be promoted, while simultaneously increasing the behavior's perceived benefits;
4. Piloting the strategy; and
5. Broad scale implementation and ongoing evaluation once the strategy has been broadly implemented.

In this overview of community-based social marketing, each of these steps will be described.

STEP 1: SELECTING BEHAVIORS

Prior to selecting which behavior(s) to promote, consider first which audiences are relevant to target. For example, imagine that a program is being developed to promote energy efficiency in order to reduce CO2 emissions. To gauge which audience should be targeted, program development should begin by comparing energy use by sector. In Canada, energy use differs markedly by sector, with industrial, transportation and residential sectors responsible for the greatest energy use (Natural Resources Canada, 2006).[2] Of these, further imagine that the residential sector has been selected as it provides the opportunity to address both residential energy use and transportation choices (in this example, however, we will focus only on residential energy use).

It is nearly always the case that organizations working to promote sustainability have a plethora of behaviors from which to choose, and residential energy use is no different. For example, in delivering a program to enhance the energy efficiency of residential homes, we could promote the installation of low-flow showerheads or programmable thermostats, the addition of insulation to an attic, or the turning off of lights. Indeed, in a program in Queensland, Australia over 200 actions were



identified that a homeowner can take to increase residential energy efficiency (Hargroves, Desha, & McKenzie-Mohr, 2009). Other areas, such as waste reduction, watershed protection, biodiversity protection and water efficiency have similarly long lists of potential behaviors that could be fostered. Clearly, not all behaviors are of equal importance, so how do we determine which to promote? Begin by assessing how your issue (e.g., landfill waste, water, biodiversity loss, air pollution) is affected by a particular sector. In the case of residential energy use, this would involve beginning by exploring how energy is used within a home.

As shown in the chart below, space heating makes up the majority of Canadian residential energy use (60%), while space cooling contributes only 2%. Clearly, far larger reductions in residential energy use, and associated CO2 emissions, can be gained by focusing on space heating rather than cooling. The chart also reveals that water heating contributes 18% of energy use, which is intriguing as numerous energy efficiency campaigns in Canada focus on space heating and the purchase of energy efficient appliances (the third most important category at 10%), while largely ignoring water heating.

This type of analysis provides useful guidance regarding which behaviors are potential candidates for programs you might deliver. Based on the above chart, we should gravitate toward behaviors related to reducing energy use for space heating, water heating and major appliances. How do we select behaviors within each of these areas? In creating our list of behaviors we should be guided by two criteria: no behavior should be *divisible*; and each behavior should be *end-state*. As the name suggests, divisible behaviors are those actions that can be divided further into more specific behaviors. For example, adding additional insulation to a home is a divisible behavior. Homeowners might add insulation to their attics, their basements or to the external shell of their dwellings. Each of these behaviors is distinct and will have its own set of barriers and benefits. Since the barriers to sustainable behaviors are often behavior specific, it is critical to begin by listing behaviors that are non-divisible. Failing to do so will leave a program planner with *categories* of behaviors that often differ dramatically in their associated barriers and benefits.

In addition to ensuring that a behavior is not divisible, we also want to ensure that it is *end-state*. For instance, our principal interest is not in having people purchase high efficiency showerheads, but rather in having them installed. In contrast, in the case of programmable thermostats, our principal interest is not in having homeowners install a setback thermostat, but rather in them programming it. Too frequently, initiatives to promote sustainable behavior focus on prior behaviors and never achieve the end-state behavioral change that matters. In determining whether a behavior is end-state, simply ask: "Am I hoping that someone will engage in this action as precursor to the behavior I wish to promote?" If the answer is "yes," you have not selected an end-state behavior. It is important to not list actions that precede end-state behaviors as there is no guarantee that if someone engages in the activity that they will actually engage in the end-state behavior you wish to promote. Finally, in creating a list of non-divisible end-state behaviors ensure that no item on the list is a strategy. For instance, having a household participate in an energy audit is not an end-state behavior, but rather a strategy that might lead to an end-state behavior, such as installing additional insulation in an attic. It is not until we have determined the barriers and benefits to a behavior that we should begin considering strategies to facilitate the adoption of that behavior.

Once we have created a list of non-divisible end-state behaviors we will want to compare these behaviors to determine which are worth promoting. To compare them we will need three types of information for each behavior: A) What is the *impact* of the behavior; B) What level of *penetration* has the behavior already achieved (e.g., How many people are already doing the behavior); and C) How *probable* is it that those who are not yet doing the behavior will adopt it?

Determining Impact: Two options exist for identifying the impact of various behaviors. The first, and preferable option, is to collect rigorous data on the impact that a variety of behaviors will

have upon your issue. In the case of residential energy efficiency, we would want to scrutinize how various behaviors compare regarding energy use. That is, we would collect information on how behaviors, such as adding insulation to an attic, installing a high efficiency showerhead, and turning down the temperature on the hot water heater, compare to one another related to energy use. Frequently, this information is available from federal and state/provincial agencies. When such data does not exist, we will need to employ the second option, which involves surveying individuals who have technical expertise in the area of interest. It is suggested that these experts be asked to rate each behavior on a scale of 0 to 4, where "0" equals "no impact" and "4" equals "high impact." Ratings from experts should be sought independently and then averaged. That is, do not bring together a group of experts, have them discuss residential energy use associated with the list of behaviors and then have them rate the actions. Independent ratings have superior psychometric properties and are less prone to errors that can occur with group-based ratings (McKenzie-Mohr, 2010).

Determining Penetration: Two options also exist for determining penetration. The first, and most reliable, is to unobtrusively observe the target audience to gauge its present level of engagement in various behaviors. This approach works well for such behaviors as curbside recycling, bicycling and carpooling, which are easily observed, but is not useful for behaviors that are not easily observed, such as the installation of high efficiency showerheads. When behaviors are not easily observed, use the second option which involves surveying the target audience and asking them how often, if at all, they engage in each of the behaviors on the list. If the behavior is a one-time action, such as installing a water efficient showerhead, simply ask if they have done the action. In contrast, if the behavior is repetitive, such as washing clothes in cold water, ask what percentage of the time they engage in the action. As with ratings of probability, these numbers are likely to be unreliable. As a consequence, it is not the absolute numbers that we should attend to, but rather the range of values. For example, if 50% of households indicate that they have installed high efficiency showerheads and 20% note that they have insulated their hot water heater, it is not the absolute numbers (50% versus 20%) but rather the range between these numbers that we should attend to. That is, we can't say with confidence that 50% of households have installed high efficiency showerheads as there is a tendency for positive environmental behaviors to be over-reported, but we can say with confidence that high efficiency showerheads are more likely to have been installed than hot water heater insulation. Finally, remember that we are looking for behaviors that have low penetration associated with them. That is, we are looking for those behaviors that fewer people have engaged in as they provide more potential for change.

Determining Probability: Two options also exist for determining probability. The most rigorous and desirable option is to look for carefully evaluated programs that have been delivered which indicate each of the behaviors on the list. It is important to note several issues regarding such programs. First, the generalizability of the programs needs to be considered. Only those programs that closely match the circumstances and context under which it would be delivered should be considered. For instance, water shortages in Australia are a more pressing problem, and have received far more national attention, than water shortages have in Canada. Further, information regarding the per capita costs to deliver each program should be obtained so that return on investment (ROI) for each program can be calculated. Collecting detailed case study information for a long list of behaviors is cost and time prohibitive. If the list of behaviors is large, we may wish to first survey the target audience regarding the probability of them engaging in each behavior (this survey would also include the penetration ratings described above). In the case of residential energy efficiency, householders should be asked to rate the probability of engaging in each of the behaviors on a scale of 0 to 4, where "0" equals "no likelihood" and "4" equals "high likelihood." You will need to provide some context in order for the responses to be meaningful (e.g., What is the likelihood that you would install a high efficiency showerhead if you had to purchase and install the showerhead yourself? versus What is the likelihood that you would install a high efficiency

Table 1 *Formula: Weight = Impact x (1 – Penetration) x Probability*

BEHAVIOR	IMPACT (KG/PER HOUSEHOLD/ YEAR)	PROBABILITY (0 TO 4)	PENETRATION (1 - VALUE)	WEIGHT
Purchase Green Power	8700	2.15	v.85	15,899
Install 3 High Efficiency Shower heads	650	2.5	.35	569
Wash Clothes in Cold Water	450	3.09	.63	876

showerhead if we provided you with a showerhead and you had to install it yourself?). Note that as with ratings for penetrations, values obtained from this survey will not be representative of the *actual* likelihood of householders engaging in these behaviors, as there is a strong tendency for respondents to "inflate" the likelihood of engaging in a behavior. Nonetheless, the range of the values obtained is a good indicator of the *relative* likelihood of a target audience engaging in these behaviors. When the list of non-divisible endstate behaviors is large, it is worthwhile to begin with this survey in order to cull the list down to a more manageable number for which case study information (e.g., option 1) can be collected. Note that we can often substantially reduce the length of the list by focusing on those categories that will lead to the greatest impacts. In the case of reducing residential energy use in Canada that would involve behaviors related to space heating, water heating and major appliances.

Use a table such as Table 1 to compare your list of behaviors. Ideally, we are looking for those behaviors that have high impact and probability, but low levels of penetration. We can compare various behaviors by multiplying the impact that a behavior has, by the current level of penetration, by the probability of a target audience engaging in the behavior to obtain a behavior's weight (we are looking for those behaviors that have the largest weights). Since we are looking for behaviors that presently have low levels of adoption, we need to invert penetration values before multiplying the three numbers. To do this, simply subtract the present level of adoption from one (e.g., if 60% of households have installed high efficiency showerheads subtract .60 from 1 to obtain the number of people (40%) who we could realistically encourage to install high efficiency showerheads).

In determining which behaviors to select for your program, you should gravitate toward two types of behaviors. If you are interested in encouraging only one action, then you will want to choose the behavior that has the largest weight as it represents the best interaction between impact, penetration and probability. In contrast, if you are interested in encouraging a variety of actions over time, you may wish to select a behavior that has less impact, but has a very high probability of your target audience engaging in the action and for which there are currently low levels of adoption. In well designed programs, such catalytic behaviors may be used as stepping-stones to more substantive actions being taken at a later time.

In summary, begin by determining the relative importance of various sectors for the issue of concern (e.g., watershed contamination, airshed pollutants, water use, etc.). Second, for the most important sectors, determine how they contribute to your issue (e.g., what percentage of residential water use is for toilets, showering, washing dishes, washing clothes, watering lawns and gardens?). Third, determine the behaviors that are associated with each of these areas (e.g., reducing water used for showering could involve taking shorter showers or installing high efficiency showerheads). Fourth, compare these behaviors regarding impacts, penetration and probability to determine the most important behaviors to target in your program. This process can be used for a wide variety of environmental issues and will significantly enhance your confidence that you have selected the most appropriate behaviors to target.

STEP 2: IDENTIFYING BARRIERS AND BENEFITS

Research indicates that each form of sustainable behavior has its own set of perceived barriers and benefits (Oskamp et al., 1991; McKenzie-Mohr et al., 1995; Tracy, 1983-84). For example, the factors that impede individuals from composting are quite different from those that preclude more sustainable forms of transportation. Even with apparently closely associated behaviors such as recycling, composting and source reduction, different sets of barriers and benefits have been found to be important. Further, barriers and benefits also differ by groupings of individuals or "segments." Identifying these segments occurs during both the first and second steps of community-based social marketing. When selecting behaviors, determining which sectors are most important (e.g. residential, commercial, etc.) broadly defines target audiences. During the second step, uncovering how barriers and benefits differ for different segments within a sector will allow one to more effectively target different audiences. For instance, low-income households will be less able to afford the purchase of a high efficiency showerhead than households that are more affluent. Consequently, a strategy to encourage the installation of high-efficiency showerheads for low-income households would differ from a strategy that was promoting the same behavior for more affluent households.

Barriers to a sustainable behavior may be unique to an individual, such as one's lack of knowledge, nonsupportive attitudes or an absence of motivation (Stern & Oskamp, 1987). On the other hand, barriers may reside outside the individual, as in changes that need to be made in order for the behavior to be more convenient (e.g., providing curbside organic collection) or affordable (e.g., subsidizing public transit or compost units). Multiple barriers may exist for any form of sustainable behavior. As a result, once we have selected which behavior has the best combination of impact, penetration and probability, we next need to identify its barriers and benefits.

Uncovering barriers and benefits involves four steps. Begin by reviewing relevant articles and reports. Next, obtain qualitative information through observations and focus groups; methodologies that are intended to help you identify "a list" of potential barriers and benefits. Finally, conduct a survey with a random sample of your target audience. The use of several different methodologies to uncover and rank barriers and benefits is called triangulation. Triangulation allows the weaknesses of one approach (e.g., focus groups have poor generalizability due to the small number of participants and low participation rates) to be addressed by the strength of another approach (e.g., survey results can be more easily generalized to your target audience, but don't often provide the rich detail that focus groups do).

LITERATURE REVIEW: In conducting the literature review consult four sources: 1) Trade magazines and newsletters; 2) Reports, 3) Academic articles, and 4) Authors of reports and articles that are particularly useful.

OBSERVATIONS: Observational studies of specific behaviors are another valuable tool. By directly observing people, we can more easily identify skill deficits, and sequences and incentives that are already at work to reward existing behaviors. Observational studies help reduce the problems of self-report data and get the researcher much closer to the community and the behavior. Observation is also useful in evaluating behavioral compliance, particularly for behaviors where people are being asked to learn and maintain new skills.

FOCUS GROUPS: The literature review and observations will assist you in identifying issues to further explore with your target audience through focus groups and a survey. Limit the size of each focus group to 6 to 8 people and divide participants into different groups based on whether they have previously engaged in the behavior (e.g., installed a programmable thermostat) or not. Further, make it easy for people to participate by providing services such as childcare and transportation. Come to the focus groups with a set of clearly defined questions that have been informed by the literature review and observations. The leader of the focus groups must clearly steer the discussion and ensure that all participants feel comfortable in participating. Have an assistant who takes notes during the group. Don't provide information about your program prior to the focus groups, as this information will influence the information received from participants. When the focus groups are completed, tabulate the responses and identify barriers and benefits that are mentioned by significant numbers of participants (see the Focus Group Kit by Morgan and Krueger, 1998, for further information).

Focus groups are useful in obtaining in-depth information but are limited by the small number of participants and the influence that the group itself has upon what each member feels comfortable saying. Surveys overcome these two limitations.

SURVEYS: Conducting a survey consists of seven steps. First, begin by clarifying the objective of the survey. Do this by creating a survey objective statement, which indicates the purpose of the survey. A good question to help facilitate this is to ask "What decisions am I trying to make that I need this research to help answer?" This statement can be used to ensure the support of colleagues before proceeding and act as a reference when later deciding upon the relevance of potential survey items. Second, list the items that are to be measured. Note that at this point we are not concerned with writing the questions, but rather with identifying the "themes" or "topics" that will be covered in the questionnaire. Third, have someone skilled in survey development write the survey. Fourth, when the survey is completed, take the time to pilot it with 10 to 15 people. Piloting the survey allows you to scrutinize the wording of the questions and the length of the survey. Don't include the data obtained from the pilot with the data obtained from the actual survey. Fifth, select the sample. Surveys are most useful when the respondents are randomly selected from the target audience. A sample has been randomly selected when each adult in the target audience has an equal chance of being asked to participate. When this criterion is met, we can generalize results back to the whole community with greater confidence. As with the focus groups, survey samples should be comprised of two sub-groups, those who have engaged in the behavior already and those who have not yet done so, sometimes referred to as a "doer versus nondoer" analysis. Sixth, conduct the survey, as quickly as possible to reduce the likelihood of an event in the real world impacting upon your survey results (e.g. BP and the Gulf of Mexico). Seventh, analyze the data. Unless you have someone on staff with a statistical background, you will want to have the survey data analyzed for you. In having the data analyzed, ask for a thorough description of those individuals who are engaging in the activity, as well as for those that are not (descriptive statistics). Also, ask for the factors that distinguish people who are doing the behavior, such as composting, from those who are not, and the relative importance of these factors (multivariate statistics).

Significant pressures, such as time and staffing constraints, and increased project costs, often result in this second step, the identification of barriers and benefits, being skipped. While these pressures are real and important, failure to identify barriers will often result in a program that either has a diminished impact or no impact at all. The identification of barriers and benefits is an essential step in the development of a sound community-based social marketing strategy. By conducting a literature review, focus groups, observations and a survey, you will be well positioned to develop an effective strategy.

STEP 3: DEVELOPING A STRATEGY

Community-based social marketing involves developing a strategy that addresses both the behavior we wish to promote and the behavior we wish to discourage. For the behavior we wish to promote, we want to reduce its barriers while simultaneously increasing its benefits. In contrast, we wish to do the opposite for the behavior we wish to discourage – we wish to increase its barriers while also reducing its benefits (the introduction of car pooling lanes both increases barriers to single occupant driving and reduces its benefits). A variety of behavior change "tools" can assist with this task. Additional information on these tools can be found in, *Fostering sustainable behavior: An introduction to community-based social marketing 3rd Edition* (McKenzie-Mohr, 2011).

COMMITMENT: In a wide variety of settings, people who have initially agreed to a small request, such as to wear a button saying they support the purchase of products with recycled-content, have subsequently been found to be far more likely to agree to a larger request, such as actually purchasing these products (McKenzie-Mohr, 2010).

Why does seeking commitment to an initial small request work? There are likely two reasons (Cialdini, 1993). First, when people go along with an initial request, it often alters the way they perceive themselves. That is, they come to see themselves, for example, as the type of person who believes it is important to purchase products that have recycled content. Second, we have a strong desire to be seen as consistent by others. Indeed, our society emphasizes consistency and people who are inconsistent are often viewed negatively. As a result, if we agree to wear a button supporting the purchase of recycled-content products, it would be inconsistent not to purchase these products when we shop.

Commitment has been used as a behavior change tool in a variety of studies with often-dramatic results. In considering using commitment, follow these guidelines:

Emphasize public over written or verbal commitments. Public commitments (e.g., having a sign placed on lawns indicating that the lawn is pesticide free) have been found to be more effective in bringing about longterm behavioral changes (Pallak, Cook & Sullivan, 1980).

Seek commitments from groups of people that are highly cohesive, such as a church group. The close ties of these individuals, coupled with the importance of being consistent, make it more likely that people will follow through with their commitment (Wang & Katzev, 1990).

Actively involve the person. When people are actively involved, such as being asked to peer into an attic to view the amount of insulation or hold a container to measure the flow-rate of a shower, they are more likely to see themselves as committed to the activity (Gonzales, Aronson, & Costanzo, 1988).

Use existing points of contact to obtain commitments. Wherever natural contact occurs, look for opportunities to seek a commitment. For example, when people purchase paint ask them to sign a commitment that they will dispose of any leftover paint properly, or, better yet, take it to a paint exchange if one exists.

Help people view themselves as environmentally concerned. We can help people see themselves as environmentally concerned, and therefore more committed to other sustainable activities, by commenting on their past actions (McKenzie-Mohr, 2011). For example, when people come to pick up a composter, ask if they recycle. If they do, note that their recycling is evidence of their concern for the environment and that beginning composting is a natural way to reduce waste even more.

Don't use coercion. In order for this behavior change tool to be effective, the commitment has to be freely volunteered. That is, only ask for commitments when people appear to be interested in an activity (McKenzie- Mohr, 2011).

PROMPTS: Numerous behaviors that support sustainability are susceptible to the most human of traits: forgetting. People have to remember to turn off lights, check the air pressure in car tires, turn off the engine when waiting to pick someone up, turn down the thermostat, select items that have recycled-content, etc. Fortunately, prompts can be very effective in reminding us to perform these activities. Prompts are visual or auditory aids that remind us to carry out an activity that we might otherwise forget. In using prompts you will want to ensure that you follow these guidelines (McKenzie-Mohr, 2010):

Make the prompt noticeable. In order for a prompt to be effective it has to first be noticed. Make sure that your prompt is vivid (a bright color) and eye-catching.

Make the prompt self-explanatory. All the information that is needed for people to take the appropriate action should be conveyed in the prompt. For example, if we were using a prompt to increase the likelihood that people with odd numbered street addresses would only water their lawns on odd numbered calendar days (and vice versa), the prompt that we attach to an outside faucet could read (water your lawn only on odd numbered calendar days).

Present the prompt in as close proximity as is possible to where the action is to be taken. If we wanted to encourage people to turn off lights upon leaving a room, for example, we would affix the prompt beside or directly on the light switch plate.

Use prompts to encourage people to engage in positive behaviors. It is important, when possible, to encourage positive behaviors. If you want people to purchase environmentally friendly products when shopping, place prompts throughout a store that bring attention to those items rather than bringing attention to items that should be avoided. Not only is the encouragement of positive behaviors more likely to be supported by retail outlets (few would let negative prompts be posted), but positive behaviors also make people feel good about their actions, which increases the likelihood that the actions will be carried out in the future.

NORMS: To date, few programs have emphasized the development of community norms, which support people engaging in sustainable behavior. This lack of attention to norms is unfortunate given the impact they can have upon behavior. Norms guide how we should behave (McKenzie-Mohr, 2011). If we observe others acting unsustainably, such as using water inefficiently, we are more likely to act similarly. In contrast, if we observe members of our community acting sustainably we are more likely to do the same. When considering including norms in programs you develop, keep the following guidelines in mind (McKenzie-Mohr, 2010):

- Make the Norm Visible. For norms to influence the behavior of others they have to be aware of the norm. The very act of taking recyclables to the curbside, for instance, communicates a community norm about the importance of recycling. Most sustainable activities, however, do not have the community visibility that

recycling has, and norms that support the activity, therefore, have to be promoted more actively. Find ways to publicize involvement in sustainable activities, such as providing ongoing community feedback on the amount of water that has been saved by homes using water efficiently.

- Use Personal Contact to Reinforce Norms. Research suggests that internalization of norms is more likely to occur as a result of personal contact. As a consequence, use personal contact as an opportunity to reinforce norms that support sustainable behavior.

SOCIAL DIFFUSION: New behaviors are frequently adopted because friends, colleagues or family members have adopted the behavior – a process known as social diffusion (Rogers, 2003). Social diffusion has been found to be relevant to the adoption of a wide variety of sustainable actions, including, for instance, the installation of programmable thermostats and solar hot water heaters (Darley & Beniger, 1981). There are two ways to encourage the adoption of new behaviors through social diffusion:

- Make Commitments Public and Durable: Many of the sustainable actions that we would like people to adopt have no visibility in the community (McKenzie Mohr, 2010). For example, if a household installs a high efficiency showerhead no one in the community is aware that this behavior has taken place. Contrast the installation of high efficiency showerheads with curbside recycling, in which the placement of a container at the curbside clearly communicates engagement in the behavior. An effective way to increase the visibility of *invisible* behaviors is to ask for public commitments, such as the placement of a sticker on the side of the recycling container indicating that a household has installed a high efficiency showerhead. Whenever possible, these public commitments should be durable. That is, favor attaching a sticker to the side of a recycling container versus asking people to put signs on their lawns. The sign is likely to last only a few weeks while the sticker might last for several years. Public and durable commitments enhance social diffusion by encouraging conversations regarding the behavior.

- Recruit Well Known and Well Respected People. Individuals who are well known and well respected have an inordinate impact upon the adoption of new behaviors. For example, well known and well-respected farmers are more likely to affect the practices of other farmers than those who are less well known and less respected (Rogers, 2003). To identify these individuals, simply ask a number of members of your target audience who is well known and well respected.

SERVICES OR PRODUCTS: Effective programs often involve providing our target audience with a service (household energy audit) or a new product (high efficiency showerhead). Note that barriers exist to the provision of services (e.g., cost of an audit, when they are available) and products (e.g., cost to purchase the product, knowledge of product, availability of product) that a program needs to address if it is to be effective. The delivery of a new service (curbside collection of recyclables) and the provision of a new product (curbside recycling cart) can often dramatically affect the barriers to a behavior and encourage its rapid adoption.

COMMUNICATION: Most programs to foster sustainable behavior include a communication component. The impact of communications upon behavior can vary dramatically based upon how the communications are developed. To develop effective communications, consider the following elements:

Use captivating information. All persuasion depends upon capturing attention (Stern & Aronson, 1984). Without attention, persuasion is impossible. Communications can be made more effective by ensuring that they are vivid, personal and concrete (Gonzales, Aronson, & Costanzo, 1988).

Know your audience. All communications should be developed with your audience in mind. Before developing communications, you should have a firm sense of the attitudes, beliefs and behavior of your intended audience(s).

Use a credible source. The individual or organization that presents your message can have a dramatic impact upon how it is received and subsequent behavior (Eagly & Chaiken,1975). Ensure that whoever delivers your message is seen as credible. Individuals or organizations tend to be viewed as credible when they have expertise, or are seen as trustworthy.

Frame your message. How you present or "frame" your activity can affect the likelihood that people will engage in it (Davis, 1995). In general, you should emphasize the losses that occur as a result of inaction (e.g., from not insulating) rather than the savings that occur from action (e.g. insulating).

Carefully consider threatening messages. While environmental issues lend themselves easily to the use of threatening messages, do so with caution. While the public needs to understand the implications of such serious issues as global warming, toxic waste, or ozone depletion, they also need to be told what positive action they can take if threatening information is to be useful. In short, whenever you contemplate using a threatening message consider whether you can at the same time present concrete actions that individuals can take to reduce the threat (Lazarus & Folkman, 1984).

Make your message easy to remember. All sustainable activities depend upon memory. People have to remember what to do, when to do it, and how to do it (Heckler, 1994). Use

prompts to assist people in remembering. Also develop messages that are clear and specific.

Provide personal or community goals. Providing targets for a household or community to achieve can help to provide motivation for sustainable behavior (Folz, 1991).

Emphasize personal contact. Research on persuasion documents that the major influence upon our attitudes and behavior is the people we interact with rather than the media (Aronson & Gonzales, 1990). Create opportunities for people to talk to one another through programs such as block leaders, in which individuals from a neighborhood who already have experience in a sustainable activity, such as composting, speak to others who live close by. Through personal contact, provide opportunities for people to model sustainable behavior for one another, such as installing weather-stripping, and encourage ongoing discussions in your community to allow social diffusion of new behaviors to occur.

Provide feedback. Remember to provide members of your community with feedback about the effectiveness of their actions. Feedback has been found to have a positive impact upon the adoption and maintenance of sustainable behaviors.

INCENTIVES/DISINCENTIVES: Incentives have been shown to have a substantial impact on a variety of sustainable activities including waste reduction, energy efficiency and transportation. They are particularly useful when motivation to engage in action is low or people are not doing the activity as effectively as they could. Gardner and Stern (1996) suggest the following guidelines in using incentives/disincentives:

Closely pair the incentive and the behavior. The closer in time the incentive is presented to the behavior it is meant to affect, the more likely that it will be effective.

Use incentives to reward positive behavior. Where possible, use incentives to reward people for taking positive actions, such as returning beverage containers, rather than fining them for engaging in negative actions, such as littering.

Make the incentive visible. For incentives to be effective, you need to draw people's attention to them. Consider using vivid techniques to make incentives noticeable. Also, incentives can be made more visible by closely associating them with the behavior they are meant to affect, such as having people attach tags to their garbage bags in order to have them picked up in a user pay garbage disposal program.

Be cautious about removing incentives. Incentives can be powerful levers to motivate behavior, but they can also undermine internal motivations that people have for engaging in an activity. If you plan to use an incentive to encourage a sustainable behavior, remember that if you elect to remove the incentive at a later time the level of motivation that existed prior to the introduction of the incentive may no longer exist.

Prepare for people's attempts to avoid the incentive. Incentives such as separate laneways for multiple occupant vehicles can have a significant impact upon behavior. However, because these incentives powerfully reward one behavior (car pooling) and strongly punish another (single occupant driving), there is strong motivation to try to "beat" the incentive and not engage in the desired sustainable behavior (e.g., Having a mannequin as a passenger rather than a real person in order to drive in carpooling lanes). In preparing incentives, give careful consideration to how people may try to avoid the incentive and plan accordingly.

Carefully consider the size of the incentive. In arriving at what size of incentive to use, study the experience of other communities in applying incentives to motivate the same behavior.

Use non-monetary incentives. While most incentives are monetary, nonmonetary incentives, such as social approval, can also exert a strong influence on behavior. Consider ways that social approval and other nonmonetary incentives can be integrated into your program.

CONVENIENCE: The behavior change strategies presented above can have a significant influence upon the adoption and maintenance of sustainable behaviors. However, they will be ineffectual if significant external barriers exist to the behavior you wish to promote (McKenzie-Mohr, 2011). It is important to identify these external barriers and plan for how you will overcome them. Study other communities to see how they have managed to overcome similar obstacles. For example, some communities now provide curbside pickup of used motor oil, dramatically enhancing the convenience of proper disposal. Assess whether you have the resources to overcome the external barriers you identify. If you do not, carefully consider whether you wish to implement a program until you are able to address these barriers effectively.

STEP 4: CONDUCTING A PILOT

As noted previously, the design of a community-based social marketing strategy begins with carefully selecting a behavior, identifying a target audience, and then identifying the perceived barriers and benefits to the activity you wish to promote. Knowledge of these barriers and benefits is particularly important. Without this information it is impossible to design an effective program. In identifying barriers, be sure to conduct statistical analysis that allows you to rank order the barriers and benefits. Knowing their relative importance allows limited resources to be used to their greatest benefit. Once you have identified and ordered the barriers and benefits of your target audience, select behavior change tools that match the barriers you are trying to overcome and create or highlight perceived benefits. When you have arrived at a design for your program, obtain reactions to your plans from several focus groups. Look for recurring themes in their comments as they may indicate areas in which your planned program needs to be redesigned.

Once you are confident that you have a program that should affect behavior, pilot the program. The most common pilot involves collecting baseline measurements, implementing a strategy, and then collecting follow-up measurements. While this is the most common form of pilot, avoid using this method. Imagine that we are developing a program to encourage bus ridership. We collect data on the number of people riding the bus prior to implementing our strategy and then again afterward and notice a marked increase. However, at the very same time that we implemented our strategy the cost of gasoline rose sharply. As a consequence, we do not know whether it was our strategy, the cost of gasoline, or a combination of the two that led to the observed increase in ridership. To avoid this problem, in conducting the pilot ensure that you have at least two groups; one that receives the strategy that you developed and another that serves as a comparison or control group. You may have more than one strategy group if you have developed more than one strategy. Testing several strategies against each other on a small scale is an effective way of identifying the most cost effective way of affecting behavior change. When possible, randomly assign your target audience into each of your groups. Using random assignment ensures that the only difference between your groups is whether or not they received a strategy or were in a control group. In evaluating the effectiveness of a pilot, focus on behavior change rather than measures of awareness or attitude change. Further, try to measure behavior change directly rather than relying on self-reports as these reports are prone to exaggeration. If a pilot is not successful in altering behavior, revise the strategy and pilot it again. Assuming that we know why a pilot did not work, and that we now have the information needed to go straight to community-wide implementation, can be a very expensive mistake.

Finally, when conducting a pilot, only include those program elements that you can afford to deliver in a broad scale implementation. If you deliver a pilot in which you violate this rule and then strip away program elements for your broad scale implementation, your broad scale rollout may be unsuccessful.

STEP 5: BROAD SCALE IMPLEMENTATION AND ONGOING EVALUATION

When a pilot is effective at changing behavior we are ready to implement the strategy across the community. Evaluate community-wide implementation by obtaining information on baseline involvement in the activity prior to implementation, and at several points afterward. This information can be used to retool a strategy as well as to provide a basis for continued funding and provision of important feedback to the community.

CONCLUSION

The process of community-based social marketing (carefully selecting behaviors, identifying the barriers and benefits for the selected activity, developing strategies to target these barriers and benefits, pilot testing the strategy, and finally broadly implementing it once it has been shown to be effective) is transforming the way that environmental behavioral change programs are delivered.

Endnotes

1 This overview of community-based social marketing first appeared as a "Quick Reference" addendum in the second edition of Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing. A revised version appeared in the International Journal of Sustainability (McKenzie- Mohr, 2008). It was further updated for the book, Social Marketing to Protect the Environment (Sage, 2011). © Doug McKenzie-Mohr

2 Note that you cannot simply look at energy use, as various forms of energy production differ dramatically in their output of CO2 (e.g., coal versus hydro electric).

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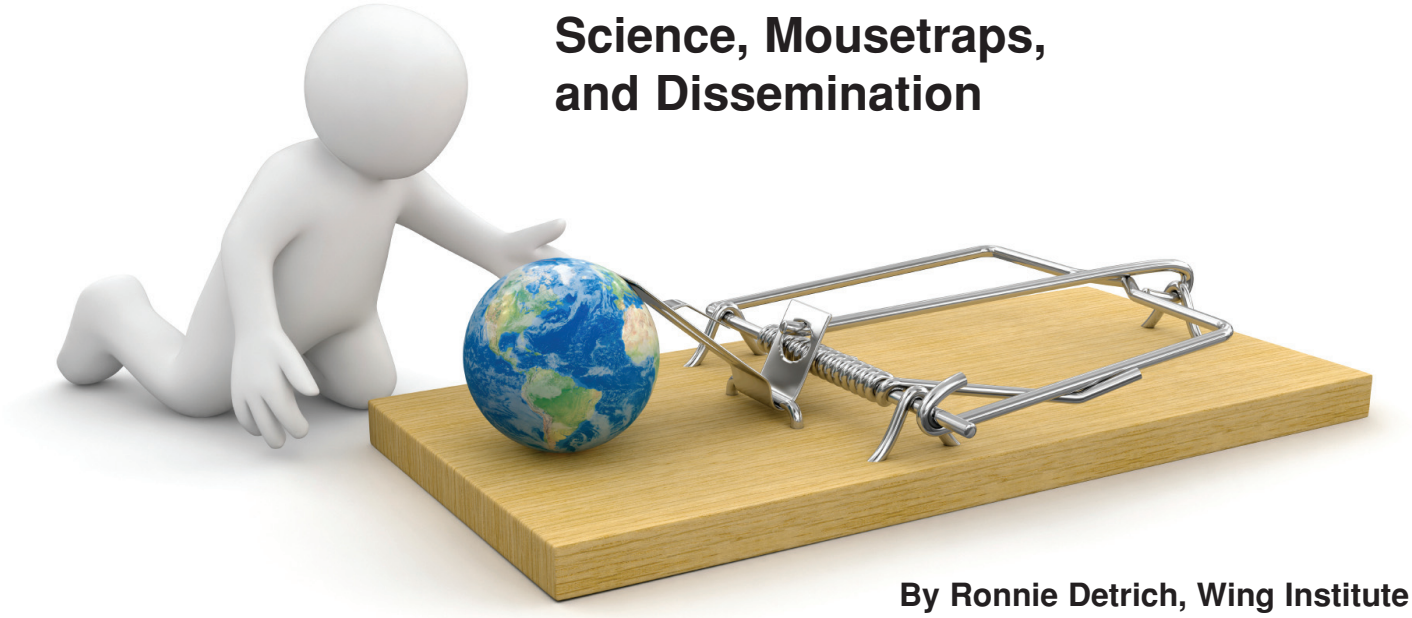


Science, Mousetraps, and Dissemination

By Ronnie Detrich, Wing Institute

Abstract

Most scientists agree that global warming is largely a result of human behavior. If we are to impact climate change then it will be necessary to change human behavior on a large scale. To date, most efforts for large-scale change have not been especially successful. In this paper, it is suggested that the science of dissemination has something to contribute to increasing environmentally responsible behavior. The principles of the science of dissemination are reviewed and are used to account for a successful effort at large-scale change.

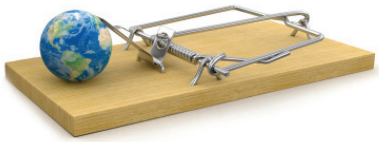
Introduction

The large majority of scientists agree that global warming is a function of human behavior. This suggests that efforts to slow down or reverse the effects of global warming will require significant change in human behavior. Given the magnitude of the problem and the scale of what is required to address the problem, it seems reasonable to turn to science. Science has solved many problems of great importance such as the eradication of many diseases; however, some of the solutions (better mousetraps) have not been rapidly adopted to make a difference at the societal level. One of the best examples of very slow adoption and dissemination of effective practices is the history of scurvy in the British Royal Navy. For years, scurvy plagued sailors on long voyages. In 1601, James Lancaster demonstrated experimentally that eating citrus fruit prevented scurvy. The impact of this discovery was less than overwhelming. The British Royal Navy did nothing in response to these results and scurvy continued unabated. Almost 150 years later in 1747, John Lind again demonstrated experimentally that eating citrus fruits prevented scurvy. Again, the Navy largely ignored the results of the experiment. Finally, in 1795, the British Royal Navy adopted the policy of putting citrus fruits on all ships and scurvy ceased to be a problem. It took almost 200 years for the Navy to adopt a very simple solution to a very big health problem. The question is why did it take so long and what lessons can we draw from this in our efforts to improve the health of the planet? This example and many others disprove the adage that "if you build a better mousetrap, the world will beat a path to your door."

The science of discovery is very different from the science of dissemination and implementation. The science of discovery finds answers in the physical world such as the causes of diseases. The science of dissemination and implementation is concerned with the social world and what accounts for the very slow or rapid changes in societal practices. The science of discovery and the science of dissemination deal with very different content and problems. Both are concerned with different kinds of phenomena and different types of causal mechanisms. The purpose of this paper is to consider those variables that are likely to influence the adoption rate of good practices. The challenge is to accelerate the rate of adoption of environmentally responsible behavior to improve the health of the planet and it must occur on a scale of enormous proportions.

Science of Dissemination

Most efforts at influencing the behavior of others have relied on hope and rational argument. These efforts often turnout to be relatively weak means of producing behavior change on any scale of social importance. There is an emerging science of dissemination that offers an alternative. In his classic book, Rogers (2003) outlined some principles for effective dissemination. Rogers and others, such as Marvin Harris (1979), have provided the foundations for a science of dissemination and culture change.



Principles of dissemination (taken from Rogers (2003).

1. **Diffusion (dissemination) is a social process rather than a technical process.** In order to change the behavior of others it is important to understand the social/cultural variables that established current practices and the variables that can result in changes in practice within a culture. Authorities telling of the risks of current practices such as smoking or describing more effective practices (citrus fruits on ships) do not neccesarily lead to desired changes. Greenhalgh and colleagues (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004) have described two approaches to dissemination-letting it happen and making it happen. Letting it happen is a passive approach to changing cultural practices and making it happen is an active approach using what is known from the science of dissemination. Given the urgency of improving the health of the planet, the active approach is likely the better choice.

2. **The adoption rate of innovation is a function of its compatibility with the values, beliefs, and past experiences of the individuals in the social system.** Innovations that do not require rejection of currently held beliefs, values and practices, and are consistent with the experiences of members of the culture are more likely to be adopted. One of the difficulties of introducing citrus fruits into the British Royal Navy was that there were other competing explanations for the causes of scurvy that were more consistent with the prevailing beliefs about the causes of disease. Adopting a policy of putting citrus fruits on ships required a rejection of medical wisdom of the time. New findings in medical science were necessary before adopting citrus fruit on ships was acceptable.

3. **Innovation must have a relative advantage over current practice.** Similarly, Harris (1979) has argued that practices are adopted and maintained to the extent that they have favorable, fundamental outcomes at a lower cost than alternative practices. In this economic view of culture change, Harris is suggesting that culture practices have costs and benefits in at least two ways: (a) outcomes of the current and innovative practice are similar but the economic cost of the innovation is less than the current practice (b) the costs remain constant between the two practices but the innovation results in far greater benefit than the current practice. It is common that solutions to global warming are rejected because the costs associated with the solution are perceived as being too great and would produce a drain on the economy. Often overlooked in this argument is the long term effect of the current practice on the overall health of the planet.

4. **Innovation has to solve a problem that is important for the "client."** If the members of the culture do not perceive that there is a problem, then they are less likely to make a change. In the case of the health of the planet, the changes are so incrementally small that they are not defined as a problem until the changes are dramatic and irreversible. In the U.S., roughly 50% of the population believe that the climate is changing and is a result of human activity *(*Leiserowitz, Maibach, Roser-Renouf, Feinberg, & Howe, 2012). Given this low percentage, it is unlikely that significant change in environmentally responsible behavior at the scale necessary that will make a difference will occur. Half of the population does not consider its behavior to be a contributing factor to the climate change that is occurring. A significant number of U.S. citizens do not even believe that climate change is occurring. For those who are "climate change deniers," there is no problem and therefore there is no motivation for change.

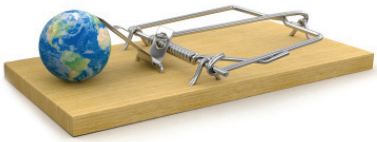
5. **It is necessary to gain support of the opinion leaders if adoption is to reach critical mass and become self-sustaining.** All too often someone from outside the social system is proposing change and is often met with great resistance. To increase the probability of adopting a new innovation it is necessary for someone who is credible within the system to champion the innovation. Not just anyone can serve this function. Individuals from the social system who are perceived to be outside the normative culture are ineffective at leading innovations. Outside experts cannot be leaders of change because they do not have credibility or relationships within the social system that are necessary to lead change efforts.

A Successful Change Effort

In this section, an example of a successful cultural change effort will be described and explained using the principles of dissemination described above. For years in the U.S there have been attempts to reduce roadside littering. The *Keep America Beautiful* campaign with the crying Native American and the National Park Service with the "Give a hoot, don't pollute" campaigns created powerful and memorable images but did little in the short term to reduce litter on the roadside. Both of these efforts relied on marketing campaigns to encourage Americans to be more respectful of the environment.

Don't Mess with Texas

The State of Texas Department of Transportation also used a marketing approach with the "Don't Mess with Texas" campaign that is generally considered to be the most successful public service campaign in recent years (McClure & Spence, 2006*)*. The



campaign consisted of a series of public service announcements (PSAs) by notable Texas celebrities. The first PSA in 1986 was Stevie Ray Vaughan, a very popular blues-rock guitar player, sitting in front of an enormous Texas state flag, playing "The Eyes of Texas." While he was playing his guitar, an announcer was doing voice over detailing the amount of roadside litter and the annual costs for cleaning it.

At the end of the PSA, Stevie Ray Vaughan said "Don't Mess with Texas." Other notable celebrities have contributed over the years including Willie Nelson, Joe Ely, the Fabulous Thunderbirds, and the Texas Tornados. The campaign turned out to be very successful at reducing roadside litter. Between 1986-1990 litter was reduced by 72% (McClure & Spence, 2006) and the effects have remained constant since that time. Following the initial success of the campaign, an elementary school curriculum was developed to teach young children about littering and its effects. There are now web-based games and activities that teachers can use as supplements to the curriculum.

Why has the campaign been so successful?

Several of the principles described above may have contributed to the campaign's success. First, the target audience for the PSAs was males between 18-35. Previous research had suggested that this was the group that was most likely to litter. By focusing on this group, the message could be tailored much more specifically. The phrase "Don't Mess with Texas" resonates very powerfully with the target audience by appealing to the powerful positive relationship between Texans and their state and their image of being able to take care of themselves. This double meaning of the message likely had a very powerful effect since it was so consistent with the values and beliefs of the target audience.

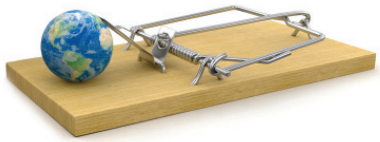
The song "The Eyes of Texas" is emotionally evocative and iconic to Texans and paired with the message "Don't Mess with Texas" while sitting in front of another powerful symbol, the state flag, creates a powerful emotional response to the message about littering. The previously established positive impact of the song, the flag, and the message not to litter likely had the effect of changing the value of littering with the very group that was most responsible for doing it. It was not uncommon for young males to drive down the road and throw cans and other litter at road signs as they passed by. The PSA changed the value of the behavior from positive to negative by making it seem unpatriotic to litter. The PSA reframed littering as a problem and one of the target group's icons was delivering the message. In recent years there have been a steady stream of research demonstrations dealing with transforming the functions of stimuli through the procedures of stimulus equivalence *[Hayes, Barnes-Holmes, & Roche, 2001]*.

At the time of the first PSA, Stevie Ray Vaughan was extremely popular with the target audience (males 18-35). He was a cultural icon and as such a very credible opinion leader for this population. His appeal was broad and cut across many of the social groups within the population. After his death, a statue of him was erected at Lady Bird Lake in Austin, Texas showing just how important he was to Texans. Given his appeal to such a broad group, his message could be relayed by more local opinion leaders across diverse social groups, which contributed to the message reaching a critical mass and sustaining the practice over the years. The groups may have been very diverse, but all could agree that messing with Texas was just not to be done. It has been 27 years since the original PSA was introduced. Over the years the Texas Department of Transportation has recruited many other celebrities who appeal to the target audience. The message remains the same, but the messenger changes as the generations change.

One of the major reasons for the success of the "Don't Mess with Texas" campaign is that it targeted a specific social group. With climate change, given the scale of changing the behavior of so many people from so many different social groups and cultures, different targeted messages will be more effective than a single message targeted to a single audience. In order for those crafting the message to be successful, they will have to act as cultural anthropologists and learn as much as possible about the values, beliefs, and symbols of the target audience. Failing to consider these variables will diminish the power of the message. The Texas experiment would suggest that the persons most able to deliver the message are not necessarily climate scientists because they do not always have the necessary credibility with the person on the street. In many respects, they speak a different language than the larger culture. The credible person for delivering the message will depend on the target group.

One of the appealing features of the marketing approach used by the Texas Department of Transportation was the speed of the change. If we are to successfully avoid some of the more catastrophic effects of climate change, we must find solutions that produce rapid change and are sustainable. Unfortunately, the window of opportunity for having an impact on the health of the planet is relatively small before the effects of climate change are irreversible.

One of the benefits of a marketing approach to producing change in socially responsible behavior is that there are a number of media outlets that are available to deliver the message to a very large percentage of the population. The "Don't Mess with Texas" campaign initially relied on radio and television to communicate the message. Today there are many more forms of social media available to get the message to a larger audience. It would be interesting to see the effects of employing Facebook and Twitter as agents for getting the climate change messge across. The role of Twitter in the Arab Spring has been well documented (Howard, Duffy, Freelon, Hussain, Mari, & Mazaid.2012). Why not employ the power of this technology to bring about changes in environmentally responsible behavior?



Other Change Efforts

While the power of marketing and social media hold great promise to effect behavior on a large scale in a very short time period, it should not be the only change mechanism employed. The importance of the problem is such that all efforts that have credible scientific evidence to support their use should be brought to bear on the problem. There are a number of empirical studies demonstrating the power of behavioral approaches to changing the behavior of large groups (Hayes & Cone, 1977; Slavin, Wordarski, & Blackburn, 1981*)*. Most of these studies have relied on some version of feedback to the participants to reduce their energy use as well as other "green" behaviors. These approaches hold great promise. In terms of the principles described above, feedback systems increase the advantages of behaving responsibly by providing direct feedback about performance. Generally, irresponsible behavior is easier to do than responsible behavior, therefore it costs less for the individual to be irresponsible. Feedback alters the economic relationships. Responsible behavior now has relatively immediate positive social effects, which can minimize the extra effort required to be responsible. The research in delay discounting suggests that the longer the delay to consequences the less value it has for a person (Rachlin, 2004). Kimball and Heward describe the use of indiscriminate contingencies to increase the range of green behaviors that can be influenced by one strategy. The basic strategy is that a number of different behaviors are part of the reinforcement contingency, but on any given day only one of those behaviors will be reinforced. Since an individual is not aware of which behavior is important on a given day, it is in the person's best interest to engage in all of the behaviors that are part of the contingency. Generally, behavioral efforts have focused on one or a very narrow range of behaviors as the focus for change. In the indiscriminate contingency arrangement, a great many green behaviors can be influenced.

If we are to bring about important change at scales of social importance in a reasonable time frame, we must move from communicating about the science of climate change to using professionals who know about changing human behavior. This would include behavior analysts, behavioral economists, marketing experts, and cultural anthropologists. These behavior change experts must work alongside climate experts so the message can be crafted in such a way as to influence the most relevant behaviors. The stakes are too high not to promote collaboration between the various groups. Bringing these groups together will not be easy since they all operate differently. Many scientists may be uncomfortable marketing their message in the same way that any other product is sold. The Texas experience with "Don't Mess with Texas" shows that it is possible to market environmentally responsible behaviors in a way that has great positive impact. Ultimately, this is the goal, to change the behavior of humans with respect to their care for the planet.

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