
Be the Change You Want to See: Modeling Food Composting in Public Places

Environment and Behavior

45(3) 323–343

© 2011 SAGE Publications

Reprints and permissions:

sagepub.com/journalsPermissions.nav

DOI: 10.1177/0013916511431274

eab.sagepub.com



Reuven Sussman¹ and Robert Gifford¹

Abstract

Composting biodegradable material is an effective means of reducing landfill waste and improving the state of the environment. To encourage the use of public compost bins, two interventions were introduced in community shopping center food courts and a local, independently owned fast food restaurant: tabletop signs outlining the benefits of composting and models who demonstrated the behavior. When diners ($n = 540$) viewed confederate models composting ahead of them, they were more likely to compost as well ($p < .001$). However, the signs did not significantly influence composting rates, either alone ($p > .05$) or in combination with the models ($p > .05$). Results support the idea that proenvironmental actions can influence similar behavior in others and may be more effective than signage in doing so.

Keywords

modeling, visual prompt, sign, compost, proenvironmental behavior

The impact of human behavior on the planet's resources and ecosystems is ever increasing, with much of the world's municipal waste ending up in landfills (Clean Air Council, 2006; European Commission, 2005; United Nations

¹University of Victoria, BC, Canada

Corresponding Author:

Reuven Sussman, University of Victoria, 3800 Finnerty Rd., Victoria, BC V8P 5C2, Canada.

Email: reuven.sussman@utoronto.ca

Statistics Division, 2007). In addition to damaging valuable habitat and arable land, greenhouse gases like carbon dioxide and methane are produced as a by-product of waste decomposition (Doorn & Barlaz, 1995). This problem is compounding as the amount of municipal waste increases globally (United Nations Statistics Division, 2007). Despite the infrastructure available for composting and recycling in many cities, a significant proportion of this organic waste remains in landfills. Opportunities still therefore exist for diverting much of our waste and increasing sustainability. Many proenvironmental waste-management behaviors are currently practiced by individuals as part of their daily routines (e.g., reusing or recycling goods); however, community composting practices are less well known. They are an important method for individuals to further participate in effective waste diversion.

Composting

Composting¹ reduces the amount of organic waste that ends up in landfills, along with the leachate it produces (United States Environmental Protection Agency, 2008). In addition, composting has the potential to reduce greenhouse gas emissions such as methane (Favoio & Hogg, 2008) while creating a marketable soil supplement that has several advantages over commonly used chemical fertilizers (Bulluck, 2002). Thus, composting may help to mitigate climate change, reduce the pressure on existing landfills (and the need to create new ones), and improve agricultural soil quality.

One method of encouraging composting may be through the development of a procomposting social norm. Once a social norm is established, the behavior is likely to be adopted by those not yet practicing it, thereby further solidifying it as common practice. New individuals joining the group will be more likely to adopt this normative behavior. But how can a social norm be established when one does not exist to begin with? The focus theory of normative conduct (Cialdini, Kallgren, & Reno, 1991) may offer a solution.

The Focus Theory of Normative Conduct

Focus theory (Cialdini et al., 1991) postulates that two types of social norms exert influence on individuals: injunctive and descriptive. An injunctive norm is an understanding of what *ought* to be done, whereas a descriptive norm is an understanding of what actually *is* done (Cialdini et al., 1991). Both types of norms may influence behavior, depending on which is the current focus of attention. Therefore, if one tries to encourage the adoption of a new proenvironmental behavior by transmitting the message only that a

given behavior *ought* to be done, then focus theory suggests that the attempt may be crippled if people believe that the behavior is currently engaged in by few others. When the two norms align (i.e., the descriptive norm matches the injunctive norm), individuals are predicted to behave in accordance with them (Cialdini, 2003). Consequently, to maximize the potential that a novel proenvironmental behavior, such as composting, be adopted by the population, focus theory suggests that individuals should perceive it both as good (socially approved of—the injunctive norm) and widely practiced (descriptive norm). The present study examines a focus theory approach in which signs deliver an injunctive norm message and confederate models help create the descriptive norm impression that composting is already practiced by others.

Signs

Signs can provide viewers with practical information, persuasive information, and behavioral cues for decision making (Geller, 1989). Effective visual prompts have five main characteristics: (a) the target behavior is relatively convenient to engage in, (b) the behavior is specified in precise terms, (c) convenient alternative desirable behaviors are suggested when an undesired behavior is targeted (e.g., disposing of bottles in a recycling bin rather than the garbage), (d) the message is delivered in close proximity to opportunities for engaging in the target behavior, and (e) the message is stated in polite language that does not threaten an individual's perceived freedom (Geller, Winett, & Everett, 1982).

Advertising research also provides suggestions for the design of effective visual prompts. A pleasant or funny visual prompt may be successful because it creates a positive emotional state in the reader (Bennett, 1998), as long as it is not ambiguous (Horsley, 1988). Adding a picture to a written communication may make the communication more effective (e.g., Perrine & Heather, 2000), although if the message becomes clouded by too many images, it may be rendered less so (Van Meurs & Aristoff, 2009). Thought-provoking signs may be particularly useful for encouraging recycling (Werner, White, Byerly, & Stoll, 2009); traffic sign and computer lab studies also suggest that noticeability, simplicity, and clarity are important aspects of sign design (Kline & Beitel, 1994; Manstead & Lee, 1979; Shieh & Lai, 2008; Williams, Thyer, Bailey, & Harrison, 1989). The context of the sign and the target audience it will influence are characteristics which may be most important.

Thus, designing visual prompts which account for all of these principles can be tricky. Although effective signs have been created to encourage a

number of proenvironmental behaviors, such as polystyrene recycling and litter cleanup after eating in cafeterias, and turning off lights in unoccupied rooms (Craig & Leland, 1983; Dixon, Knott, Rowsell, & Sheldon, 1992; Sussman, & Gifford, 2012; Werner, Rhodes, & Partain, 1998), poorly designed or situated signs can also have a negative effect (e.g., Thurber & Snow, 1980).

Modeling

The phenomenon of learning through observation is well established (e.g., Bandura, 1977), and several field studies have investigated the influence of *subtle* modeling techniques on the behavior of others. Typically, confederates demonstrate the target behavior in front of bystanders and then observe whether those individuals also engage in the behavior. These techniques have been used to encourage bystanders to sign a petition (Bégin, 1978), eat more crackers in an experimental setting (Rosenthal & Marx, 1979), tip bakery employees (Guéguen, 2007), reduce or increase litter in public places (Cialdini, Reno, & Kallgren, 1990), and pick up campsite litter (Wagstaff & Wilson, 1988).

Three previous studies have examined the use of *both* signs and models as antecedent strategies to encourage behavior change. The first aimed to encourage water conservation in a college shower room (Aronson & O'Leary, 1982-1983). A sign was mildly effective (20% compliance), but when confederates also engaged in the behavior, compliance increased substantially (49% with one model and 67% with two models). The results supported the theory that models and signs could combine to have an effect on behavior, but the authors did not investigate the individual contributions of sign and models to behavior change.

A second study attempted to encourage students in an elevator to reduce the volume of their portable music players (Ferrari & Chan, 1991). It consisted of two experiments, one to test the effectiveness of signs and one to test the effectiveness of models (one asking the other to turn down the volume). Both interventions were useful, but the combined effects of models and signs were not examined.

More recently, in a related study on composting in a university setting, both models and signs were effective for promoting proper trash separation (Sussman, Greeno, Gifford, & Scannell, 2013). In this study, model and sign interventions were introduced longitudinally in subsequent phases over 5 weeks. When tabletop signs were introduced and the sign above the compost

bin was upgraded, rates of appropriate composting increased from 13% to 21%. In subsequent phases, a single model composting alone did not significantly increase composting behavior, but when *two* models composted and briefly discussed it, the behavior increased (to 42%). That two models were significantly more effective than a single model was consistent with the previous model-plus-sign study (Aronson & O'Leary, 1982-1983). Dialogue between two confederates appears to be a simple and subtle way to increase the models' salience. Considerable research demonstrates that audiences can learn and recall information overheard in others' conversations (e.g., Akhtar, 2005; Fox Tree, 1999; Fox Tree & Mayer, 2008) and that it can affect their behavior (Jones & Skarlicki, 2005).

However, previous studies have not yet addressed all of the unanswered questions and methodological issues of the model-plus-sign research. Although both signs and models appear to be effective, previous research generally only took place in postsecondary settings where the population was younger, wealthier, and more liberal than the general public. Furthermore, most previous studies did not account for the possibility that participants may have been observed more than once during the experiment. This methodological issue could equate to a violation of the assumption of independence among observations and may have led to erroneous statistical conclusions about the effectiveness of the interventions. Finally, previous model-plus-sign studies did not compare the relative effectiveness of exposure to models, signs, or both.

Given the conceptual knowledge gap that remains in the research, these questions have yet to be addressed: Would models and signs be effective for promoting composting in a community setting (where proenvironmental behavior may occur less frequently than in a university)? Would the intervention remain effective if individual observations were truly independent from one another (i.e., diners were never observed more than once)? And could modeling the behavior encourage composting in the absence of procomposting tabletop signs? The present work was designed to address these questions.

This study employed interventions based on the focus theory of normative conduct to encourage a particular type of proenvironmental behavior, namely, composting. We hypothesized that (a) diners in a community setting who are exposed to models composting appropriately will be more likely than unexposed controls to compost, (b) diners who are exposed to a sign on their table with a procomposting message will be more likely to compost than those without a sign, and (c) diners exposed to both models and a sign will be the most likely to compost appropriately.

Method

Design and Setting

Diners in each of two shopping centers and a fast food restaurant were unobtrusively observed. At each location, the diners were exposed to two models, a sign, neither, or both. Thus, the quasiexperimental procedure resulted in a 2×2 design with four conditions (No Models + No Sign, No Models + Sign, Models + No Sign, Models + Sign).

The investigator placed an industrial compost bin next to the facilities' garbage and recycling bins in each location. It was then observed during the busiest operating times (8-10 hr between 10:00 a.m. and 7:00 p.m.). Given that the fast food restaurant was smaller than the other two locations, observations in this location were recorded over 2 days (rather than 1) to obtain a sufficiently large sample. Observations were also conducted on the outdoor patio because there was limited space indoors.

Seating was similar in all three locations. Square or round four-person tables were set approximately 5 to 10 feet apart from one another within large eating areas. The two shopping center food court locations included roughly a dozen fast food outlets offering a wide variety of foods and snacks in assorted compostable and noncompostable packages. The third location was a local, independently owned "burgers and shakes"-type restaurant known for its soft-serve ice cream. It was a small but busy restaurant with indoor seating, patio seating, and a drive-up pick-up window. The restaurant attracts more seniors and families, and offers a smaller selection of food than the shopping mall food courts.

The compost bin could be used to collect a wide variety of materials (e.g., wood, wax paper, or meat). The primary items that customers could compost in all three locations were paper cups, wax paper containers or wrappers, and paper napkins. Items that could not be composted included plastic lids, styro-foam containers, and plastic cutlery. Thus, inappropriate composting was defined as contaminating the compost bin with a noncompostable item or (more commonly) failing to compost a compostable item. All three locations were observed during their busiest days (i.e., Fridays and Saturdays).

By observing the locations for 1 day each (2 days at the fast food restaurant), the likelihood was high that observations were independent of one another. That is, two observations of the same diner were unlikely, given that a diner was unlikely to visit the same fast food location or shopping mall food court more than once in a day.² This design decision represents a methodological improvement over some previous studies, in which participants were likely to be observed multiple times during the course of the study.

Participants

The participants ($N = 562$) were patrons of the three dining establishments who had finished eating and had compostable waste remaining on their plates. These included a roughly equal number of males (47%) and females (53%), in (what appeared to be) a wide variety of ages.

Procedure

Diners were grouped in one of four conditions depending on where they sat to eat and whether or not the models demonstrated the behavior for them: No Sign and No models, Sign and No Models, Models and No Sign, Sign and Models. An observer monitored customers who approached the garbage/compost bin area from a table approximately 15 feet away and noted whether they composted appropriately or not, and (if not) whether they had contaminated the compost bin by discarding noncompostable items in it. To other diners, if they noticed at all, the observer appeared to be a student working on an assignment while eating. When a second experimenter was available, he would request a brief interview with a subsample of exiting diners to discuss their motivations for composting (or not).³

Signs. Simple three-panel signs were created for the study by laminating 8.5" × 11" colored sheets of paper and folding them in thirds to form a triangle. They were placed on tabletops in a location that could not easily be ignored. Most participants who had a sign on their table had to move it out of the way slightly to be able to fit their food on the table. Of the 106 participants interviewed after the study, 11% said that they did not notice a sign when it was on their table, and 20% noticed a sign when it was not on their table, but on another. Research on subtle effects (e.g., Williams & Bargh, 2008) suggests that despite not consciously recalling the sign, participants with a sign on their table may have still been influenced by it.⁴

The signs (on the bin and tables) were designed using the principles suggested by Geller et al. (1982) and were used successfully in our previous compost study (Sussman et al., 2013). In that study, composting rates significantly increased during the phase when both this tabletop sign and bin sign were introduced. As shown in Figure 1, the tabletop sign contained three panels (one on each side) that each had a message that was polite ("Please Compost Your Leftovers" written at the top) and contained a simple memorable picture. The messages were presented as three point-form notes below the picture discussing general waste and consumption problems (e.g., "North America has 8% of the world's population . . . but produces 50% of the

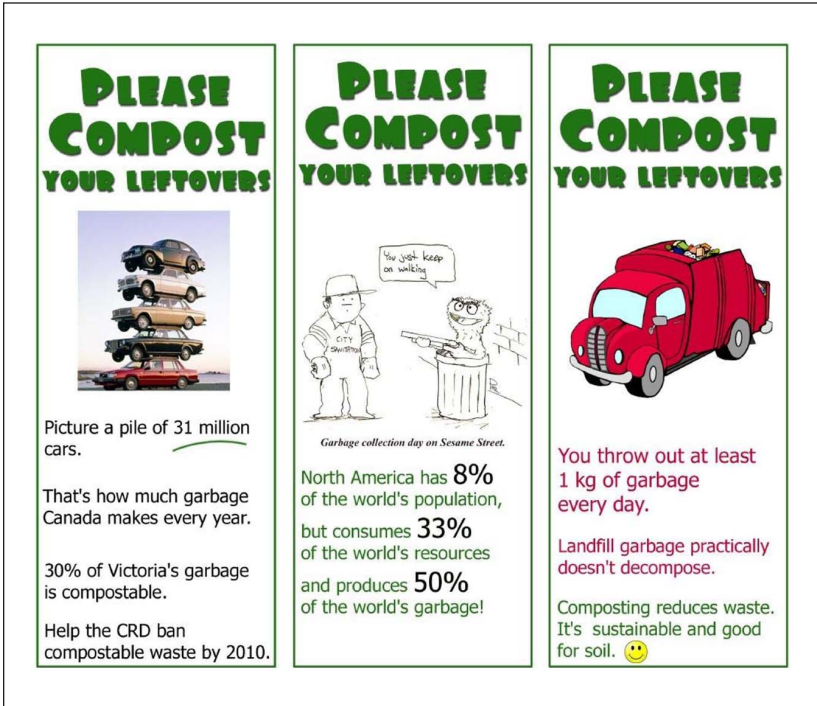


Figure 1. Tabletop sign.

world's garbage"), followed by a procomposting injunctive norm point about why composting is a good thing (e.g., "It's sustainable and good for soil"). Above the compost bin, an additional sign was mounted that described what could and could not be composted.⁵ This sign also conformed to Geller et al.'s principles and contained both words and images, as seen in Figure 2.

To optimally develop the signs, a small survey of advanced environmental psychology undergraduate students ($n = 12$) was conducted. Although small, this convenience sample of individuals was able to provide useful preliminary feedback as to the practical effectiveness of the signs. Students generally perceived the signs to be quite effective, but comments and suggestions from participants were nevertheless used to further improve the signs. For example, a more readable font was selected, and information on the signs was changed to emphasize local issues.

INDUSTRIAL COMPOSTER

YES:

FOOD



Meat, Dairy
ALL Other
Food Waste

PAPER



Napkins,
Paper Bags,
Wax Paper

**CONTAINERS/
WOOD**



Paper cups (NO LIDS),
Milk Cartons, Paper Plates
Chopsticks

NO:

PLASTIC/GLASS



METAL



STYROFOAM



Figure 2. Sign above compost bin.

In each location, the signs were placed on some tables but not others (in roughly equal numbers, within the observers' field of vision). Consequently, patrons were grouped in the "Sign" or "No Sign" conditions based on their selection of a table (which was more-or-less random depending on when tables became available). The presence or absence of a sign did not appear to influence the diners' choice of seat.

Observers noted that diners at all three community locations had similar reactions to the signs. Some diners would read all three panels of the sign in detail while eating, particularly if they were eating alone. Others discussed the signs with their group as a topic of conversation. No negative reactions to the signs were noticed (e.g., crumpling them up or damaging them).

Models. A total of 28 volunteers combined to form 23 pairs of confederates to act as models at each location. They were recruited through announcements in various classes, department email lists, word of mouth, and the 1st-year psychology credit system. Most volunteer confederates were students in their 20s, but one was a middle-aged professor and one was a 13-year-old adolescent. The diversity of ethnicities and ages of the models appeared representative of the other customers. Pairs of models were used instead of single diners because this improved the salience of the intervention and was shown to be more effective in previous research (e.g., Sussman et al., 2013).

The models sat at a table close to the garbage and compost bins in each location. When they noticed a diner approaching the area, they rose from their table and conspicuously composted their waste ahead of him or her while discussing their actions. In the presence of the customer, one model would ask the other if he or she thought it would be appropriate to compost a certain item, to which the first model responded "Yeah, it's on the sign [and pointed to the sign above the bin]." After composting, the models refilled their plates with dining-related waste in a room adjacent to the eatery and returned to their seats by the compost bin. They always included at least one compostable and one noncompostable item on their plates, and in most cases they also included an item such as a paper cup with a plastic lid which had to be disassembled and placed partly in the compost bin and partly in the garbage bin. Models were instructed to demonstrate the behavior for approximately 50% of all diners at random. However, if models were refilling their plates when a diner approached the waste disposal area, or if the diner approached suddenly from an unexpected direction, models were unable to demonstrate the behavior to the diner before he or she got to the compost bin. For these reasons, 36% of diners were exposed to the models instead of the desired 50%.

Models worked in shifts of approximately 1 hr, after which, a new pair of models would arrive and assume the previous pair's place. The models were encouraged to quietly socialize with each other to avoid drawing attention to themselves. Restaurant/food court patrons tended to engage in activities such as socializing or reading while eating and therefore paid little attention to what was going on at other tables. The shopping center food courts were very large and the fast food restaurant was smaller, but still very busy. Of the diners who were interviewed on leaving each establishment, only 3 (of 106) indicated noticing "unusual customer behavior" suggestive of deliberate modeling.

Interviews. Interviews were conducted with restaurant patrons when a second experimenter was available. Thus, a convenience sample of 106 patrons (of 562) was interviewed after disposing of their compostable waste and exiting the establishment. The length of the interview was kept short because managers at each location stipulated that customers not be bothered, and many interviews often had to be conducted in quick succession. The interviews involved three semistructured questions about why the participant did or did not compost and whether they noticed a tabletop sign or not. At each location, 18% to 21% of customers were interviewed because others either refused or left too quickly, or because too few experimenters were present at that time to both conduct interviews and observe behavior.

Results

Observation

A log-linear analysis was selected as the appropriate method for studying associations between our three dichotomous variables—Models (Yes or No), Sign (Yes or No), and Composted Appropriately (Yes or No). A total of 547 observations from all three locations were included in the overall analysis (after 15 were dropped because the observer was unsure whether the customer was exposed to the models, signs, or both). In all, 47% of all diners were male, 30% of all diners had a sign on their table, and 35% of all diners were exposed to the models. Table 1 shows the percentage of diners who composted appropriately in each of the four conditions. Overall, 27% of the observed diners composted appropriately.

The final log-linear model fit the data well, $\chi^2(2) = 0.67, p = .71$, but did not include a three-way association between models, signs, and appropriate composting (i.e., appropriate composting was not contingent on an interaction

Table 1. Percentage of Diners Who Composted Appropriately.

	No model	Model	Total
No sign	60/268 (22%)	41/108 (38%)	101/376 (27%)
Sign	16/84 (19%)	30/87 (34%)	46/171 (27%)
Total	76/352 (22%)	71/195 (36%)	147/547 (27%)

Table 2. Percentage of Diners Who Composted Appropriately in the Models and No Models Conditions at Each Location.

	No models	Models	Total
Mall 1 ^a	14/93 (15%)	23/83 (28%)	37/176 (21%) ^b
Mall 2 ^a	23/169 (14%)	16/58 (28%)	39/227 (17%) ^b
Restaurant	41/96 (43%)	33/58 (57%)	74/154 (48%)
Total ^a	78/358 (22%)	72/199 (36%)	557 (100%) ^b

^aRates of composting appropriately were significantly contingent on the presence of models, $p < .05$.

^bDiners who were previously excluded because observers did not clearly see if they had a sign on their table were included here. Therefore, the total number of observations is slightly higher in Table 1 than Table 2, but the percentages are nearly identical.

between models and signs). Appropriate composting was contingent on the presence of a model, partial $\chi^2(1) = 14.37, p < .001, \lambda = .19$, but not the presence of a sign, partial $\chi^2(1) = .41, p = .67, \lambda = -.04$. These rates of composting are summarized in Table 2. Diners composted appropriately significantly more frequently after observing the models than after not having observed them (36% with models, 22% without). Overall, signs had little effect on composting behavior, either on their own or in combination with the models.

Results of log-linear analyses for each location were similar in that the percentage of customers who composted appropriately was always higher in the Models than No Models conditions. As shown in Table 2, this difference was significant at each of the two shopping mall locations, partial $\chi^2(1) = 4.19, p = .04, \lambda = .26$ and partial $\chi^2(1) = 6.06, p = .01, \lambda = .26$, and was borderline significant at the fast food restaurant, partial $\chi^2(1) = 3.24, p = .07, \lambda = .14$. The frequency of customer composting at the shopping mall food courts was generally lower than at the fast food location. In addition, the tabletop signs at each location were not associated with increased composting rates alone, or in combination with the models at any of the locations (all $ps > .05$).

In all, 31 diners (6%) committed “composting mistakes”—contaminating the compost by disposing of noncompostable items in the compost bin (5% at one food court, 4% at the other, and 8% at the fast food restaurant).

Interviews

In each of the three locations, some diners were approached for a brief interview after leaving the eating area. In total, 133 were approached and 106 agreed to answer the questions. Seventy-four of the interviewed diners did not compost correctly, 29 of whom claimed not to notice the bin. Reasons for not composting were provided by 35 diners. A large majority of these comments ($n = 20$) were related to not knowing what could be composted in the industrial composter (e.g., “I didn’t have any food waste”), but a small proportion ($n = 7$) stated that although they did notice the bin (and would have used it), they only noticed it after disposing of their waste (e.g., “I didn’t notice the bin until after I had thrown away all my garbage”). Only 3 diners provided reasons that might be considered laziness or a lack of caring for the environment (e.g., “I didn’t bother”). Interestingly, 2 diners who did not compost correctly nevertheless made statements about the benefits of composting which reflected a procomposting attitude (e.g., “I think this is an easy way to help the environment”). This may have occurred because they did not realize that they had compostable waste to dispose of. Thirty-three of the noncomposting diners who were interviewed were exposed to the models but nevertheless did not use the bin appropriately. Of these, 14 claimed not to notice the bin. Of the remaining 19, comments were provided by 16 diners. The most common comment ($n = 6$) was reportedly noticing the bin after throwing food away, and the next most common ($n = 4$) was reportedly not thinking that they had anything to compost when, in fact, they did (e.g., “I ate all my food”). Thus, the most common reasons for not composting were claiming not to notice the bin (even when models clearly demonstrated the behavior), and claiming not to know what could be composted.

Discussion

This study demonstrated that behaving in a proenvironmental manner can influence others around to behave proenvironmentally as well. The hypothesis that diners would be more likely to compost after they were exposed to models who composted was supported, but the hypotheses that signs, or signs and models combined, would be effective in encouraging composting were rejected. These findings are discussed below.

Models. In all three study locations, diners were more likely to compost appropriately after witnessing two confederate models demonstrating the behavior ahead of them, than in the No Model conditions. This concurs with previous studies that have examined the effectiveness of modeling as a behavioral intervention (e.g., Bégin, 1978; Guéguen, 2007; Wagstaff & Wilson, 1988). Studies that employed both signs and models also generally report that models are more effective (e.g., Aronson & O’Leary, 1982-1983; Jason, Zolik, & Matese, 1979).

According to the focus theory of normative conduct (Cialdini et al., 1991), individuals are apt to conform to a descriptive norm suggesting that others are engaging in a certain behavior if that norm is brought into focus. One explanation for the models’ effectiveness, therefore, may have been that a descriptive procomposting norm was made salient: Seeing others compost activated an implicit social pressure to conform.

However, an alternative explanation for the effect of modeling is that witnessing others composting provides diners with information as to what should and should not be disposed of in the bin. That is, models showed other diners how to compost. Although the descriptive signs above the bins provided factual information to all diners, the models may have further reinforced this knowledge. In support of this explanation, most of the restaurant patrons who were interviewed and saw the bin but decided not to use it ($n = 35$), said that they “did not understand what to throw away.” This is also consistent with the results of a home composting study in which participation was predicted by “how-to” knowledge rather than by social norms (Edgerton, McKechnie, & Dunleavy, 2009). However, social norms might have been more important in that study if they had been more clearly visible. All things considered, the effectiveness of models in our study likely occurred through a combination of descriptive norm activation and improved composting knowledge.

Lower composting rates in shopping malls. Interestingly, diners in shopping mall food courts displayed considerably lower composting rates than those at the local, independent-owned fast food restaurant. There are at least two possible reasons for this discrepancy.

The first is related to the culture of materialism which is found in shopping centers. Malls are an epicenter of consumerism, where people come to buy goods and are constantly bombarded with pictures and messages espousing the value of materialism. Kasser (2006) has suggested that individuals with strong materialistic values are prone to behaving in ecologically damaging ways. In Swartz’ value terms, this may be because materialism is positively related to self-enhancement, and negatively related to self-transcendence (Kilbourne, Grünhagen, & Foley, 2005).

The second factor that may have accounted for low composting rates in the shopping centers is structural. The shopping mall food courts offer a far greater variety of food in a much more diverse array of containers. With more items to consider, diners may have been more confused regarding compostable items. In the brief interviews, 20 diners (out of 35 who did not compost) cited not knowing what to compost as the reason that they did not use the bin.

Signs. Previous research has shown that effective signs can be difficult to create. A slight change in design or placement can make the difference between an effective sign and a useless one (e.g., Wogalter, Begley, Scancorelli, & Brelsford, 1997). In some cases, a sign can even have reverse effects (e.g., Thurber & Snow, 1980). Indeed, signs are less consistently effective in directing behavior than models (e.g., Huffman, Grossnickle, Cope, & Huffman, 1995).

The tabletop signs used in this study may have been ineffective because they were not sufficiently specific, or because they were not situated in sufficiently close proximity to the location where the behavior would take place (i.e., on the table rather than on the compost bin). Alternatively, the tabletop signs may have been relevant and effective when used in a university setting but not in public restaurants. Although the signs did not contain messages that were specific to university student values, student populations (particularly at this university) may be more apt to read proenvironmental behavior messages because they are interested in environmental issues.

Interviews. All diners who were interviewed about why they did or did not compost ($n = 106$) were observed as they approached the disposal area with clearly compostable items on their trays just prior to the interview. The most common reason given for not composting was a lack of understanding of what should be composted. Possibly, with time and further experience, this barrier to composting could be reduced. No interview comments suggested the signs or models were responsible for appropriate composting, but this was demonstrated statistically. Possibly, diners did not recall being influenced by them or did not think their influence was particularly important. In addition, diners often claimed not to use the bin because they did not notice it. Noticeability could be improved in future studies by using integrated compost bins (that contain garbage, recycling, and compost in the same enclosure), better signage, increased advertising, and more bins. Unfortunately, the social desirability bias may have disinclined respondents from providing answers that made them appear “antienvironmental” or ignorant. In fact, only three diners gave answers such as “I didn’t bother” or “I wasn’t thinking,” and none indicated that they did not believe composting was important.

Community and Legal Implications

The current study supports previous research which suggests that observing modeled behavior is associated with that behavior being more likely to be performed (e.g., Ferrari & Chan, 1991; Guéguen, 2007). The social implications of this are that one way to encourage proenvironmental behaviors is to simply do them and talk about them whenever possible. Leading by example appears to be an effective strategy for behavior change in others and one mechanism by which proenvironmental behavior is adopted by society in a “bottom-up” fashion.

Rogers's (2003) diffusion of innovations model postulates how this behavior may be diffused through a community. One may liken the first composters, who lead by example, as innovators or early adopters. Although their behavior may be considered abnormal or unusual at first, after a critical mass is reached, the group becomes sufficiently influential to convince the early majority, late majority and, ultimately, the laggards to adopt the behavior. Rogers argues that the mechanism by which individuals influence others in their social networks to diffuse behavior is social learning: vicarious learning through observation. “Top-down” processes (such as legislation) are also vital for promoting proenvironmental behavior (Geller et al., 1982). When complemented by bottom-up community adoption, a near-complete societal shift is possible.

Only 4% to 8% of restaurant patrons contaminated the compost with non-compostable garbage, therefore a compost bin in public eating establishments would seem to be a feasible way to divert waste from a landfill. Because 14% to 43% of diners at each study location composted appropriately in the absence of signs or models after seeing the bin only once, clear benefits to the environment from such a program would seem to follow.⁶ All diners who were interviewed said that they believed composting was important, and several stated specific procomposting values. Therefore, enacting legislation that provides incentives for businesses to include composting services would be effective from an environmental perspective and potentially well supported. When legislation is supported (i.e., it is perceived as fair and just), community members are more likely to display an intention to abide by it (Thrasher, Besley, & González, 2010).

Conclusion

The current study provides naturalistic evidence that modeling a proenvironmental behavior can significantly increase the adoption of that behavior by

others in a community setting. The ecological validity of this study suggests that it is likely to be replicable in multiple contexts. Individual behavior can therefore be impactful in influencing collective actions, specifically in regards to encouraging municipal waste diversion.

Acknowledgments

Sara Spencer Foundation, reFUSE, Hillside Centre, Mayfair Shopping Centre, Beacon Drive In, Fred Grouzet, Jutta Gutberlet, Matt Stafford, Jordan Fogel, Matthew Greeno, Kiyuri Naicker, Leila Scannell, Christine Kormos, Angel Chen, Lindsay McCunn, and the 22 volunteers who acted as models.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Funding for this project was provided by a small local funding agency, the Sara Spencer Foundation. This agency provides funding for graduate students doing research in the city of Victoria (British Columbia) and is awarded through competition within the University of Victoria. Results of this study did not directly benefit the funding agency.

Notes

1. "Composting" may commonly refer to the process of converting organic matter to compost or fertilizing a garden using compost. In this study, the term is used to refer to putting organic waste (food and food-related waste) into a compost bin, to be decomposed at a local facility.
2. A small number of regular customers may have been observed twice over the 2 days of observation at the fast food restaurant. This was probably no more than 10 people (20 observations).
3. In this study, a single observer was used to record diner behavior because the data collection was clear and specific (with only two behavior categories). Field studies of human behavior typically include multiple observers and a measure of interrater reliability to minimize the possibility of observer bias, but this may not have been necessary for the current study. A postexperimental replication of the study with two observers (the original and another) in one shopping center location supported this assumption. In 140 additional observations, raters agreed 96% of the time with a free-marginal multirater kappa (Randolph, 2005) of 0.93. In another study, when

interrater reliability was similarly high (e.g., measurements of infant neck circumference showed interclass correlations more than .95), the authors suggested that a single observer would be sufficient (LaBerge et al., 2009).

4. Therefore, even participants without signs on their tables who did not report seeing them may have been subtly affected by them.
5. The industrial composter used in this study allowed a wide variety of normally noncompostable items to be composted (e.g., meat, chopsticks). Thus, even patrons familiar with backyard composting were forced to learn a new proenvironmental behavior.
6. As a result of several factors, including a report on the findings from this study, one of the shopping mall locations has decided to implement a composting program in their food court.

References

- Akhtar, N. (2005). The robustness of learning through overhearing. *Developmental Science*, 8, 199-209. doi:10.1111/j.1467-7687.2005.00406.x
- Aronson, E., & O'Leary, M. (1982-1983). The relative effectiveness of models and prompts on energy conservation: A field experiment in a shower room. *Journal of Environmental Systems*, 12, 219.
- Bandura, A. (1977). *Social learning theory*. Oxford, UK: Prentice Hall.
- Bégin, G. (1978). Sex makes a difference: Evidence from a modeling study conducted in a natural setting. *Psychological Reports*, 43, 103-109.
- Bennett, R. (1998). Customer recall of promotional displays at supermarket checkouts: Arousal, memory and waiting in queues. *International Review of Retail, Distribution and Consumer Research*, 8, 383-398. doi:10.1080/095939698342724
- Bulluck, L. R. (2002). Organic and synthetic fertility amendments influence soil microbial, physical and chemical properties on organic and conventional farms. *Applied Soil Ecology*, 19, 147.
- Cialdini, R. B. (2003). Crafting normative messages to protect the environment. *Current Directions in Psychological Science*, 12, 105-109. doi:10.1111/1467-8721.01242
- Cialdini, R. B., Kallgren, C. A., & Reno, R. R. (1991). A focus theory of normative conduct: A theoretical refinement and re-evaluation of the role of norms in human behavior. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (pp. 201-234). San Diego, CA: Academic Press. doi:10.1016/S0065-2601(08)60330-5
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58, 1015-1026. doi:10.1037/0022-3514.58.6.1015

- Clean Air Council. (2006). *Waste facts and figures*. Retrieved from <http://www.cleanair.org/Waste/wasteFacts.html>
- Craig, H. B., & Leland, L. S. (1983). Improving cafeteria patrons' waste disposal. *Journal of Organizational Behavior Management, 5*, 79-88. doi:10.1300/J075v05n02_05
- Dixon, R. S., Knott, T., Rowsell, H., & Sheldon, L. (1992). Prompts and posted feedback: In search of an effective method of litter control. *Behavior Change, 9*, 2-7.
- Doorn, R. J. M., & Barlaz, M. A. (1995). *Estimate of global methane emissions from landfills and open dumps* (United States Environmental Protection Agency). Retrieved from <http://www.p2pays.org/ref/07/06250.pdf>
- Edgerton, E., McKechnie, J., & Dunleavy, K. (2009). Behavioral determinants of household participation in a home composting scheme. *Environment and Behavior, 41*, 151-169. doi:10.1177/0013916507311900
- European Commission. (2005). *Waste generated and treated in Europe—Data 1995-2003*. Retrieved from http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=KS-69-05-755
- Favoino, E., & Hogg, D. (2008). The potential role of compost in reducing greenhouse gases. *Waste Management & Research, 26*, 61-69.
- Ferrari, J. R., & Chan, L. M. (1991). Interventions to reduce high-volume portable headsets: Turn down the sound. *Journal of Applied Behavior Analysis, 24*, 695-704. doi:10.1901/jaba.1991.24-695
- Fox Tree, J. E. (1999). Listening in on monologues and dialogues. *Discourse Processes, 27*, 35-53.
- Fox Tree, J. E., & Mayer, S. A. (2008). Overhearing single and multiple perspectives. *Discourse Processes, 45*, 160-179. doi:10.1080/01638530701792867
- Geller, E. S. (1989). Applied behavior analysis and social marketing: An integration for environmental preservation. *Journal of Social Issues, 45*, 17-36.
- Geller, E. S., Winett, R. A., & Everett, P. B. (1982). *Preserving the environment: New strategies for behavior change*. New York, NY: Pergamon.
- Guéguen, N. (2007). The effect of modeling on tipping behavior. *Studia Psychologica, 49*, 275-282.
- Horsley, A. D. (1988). The unintended effects of a posted sign on littering attitudes and stated intentions. *Journal of Environmental Education, 19*, 10-14.
- Huffman, K. T., Grossnickle, W. F., Cope, J. G., & Huffman, K. P. (1995). Litter reduction: A review and integration of the literature. *Environment and Behavior, 27*, 153-183. doi:10.1177/0013916595272003
- Jason, L. A., Zolik, E. S., & Matese, F. J. (1979). Prompting dog owners to pick up dog droppings. *American Journal of Community Psychology, 7*, 339-351. doi:10.1007/BF00890697

- Jones, D. A., & Skarlicki, D. P. (2005). The effects of overhearing peers discuss an authority's fairness reputation on reactions to subsequent treatment. *Journal of Applied Psychology, 90*, 363-372. doi:10.1037/0021-9010.90.2.363
- Kasser, T. (2006). Materialism and its alternatives. In M. Csikszentmihalyi & I. S. Csikszentmihalyi (Eds.), *A life worth living: Contributions to positive psychology* (pp. 200-214). New York, NY: Oxford University Press.
- Kilbourne, W., Grünhagen, M., & Foley, J. (2005). A cross-cultural examination of the relationship between materialism and individual values. *Journal of Economic Psychology, 26*, 624-641. doi:10.1016/j.joep.2004.12.009
- Kline, T. J. B., & Beitel, G. A. (1994). Assessment of push/pull door signs: A laboratory and field study. *Human Factors, 36*, 684-699.
- LaBerge, R. C., Vaccani, J. P., Gow, R. M., Gaboury, I., Hoey, L., & Katz, S. L. (2009). Inter- and intra-rater reliability of neck circumference measurements in children. *Pediatric Pulmonology, 44*, 64-69.
- Manstead, A. S., & Lee, J. S. (1979). The effectiveness of two types of witness appeal sign. *Ergonomics, 22*, 1125-1140. doi:10.1080/00140137908924687
- Perrin, R. M., & Heather, S. (2000). Effects of a picture and even-a-penny-will-help appeals on anonymous donations to charity. *Psychological Reports, 86*, 551-559. doi:10.2466/PRO.86.2.551-559
- Randolph, J. J. (2005, October 14-15). *Free-marginal multirater kappa: An alternative to Fleiss' fixed-marginal multirater kappa*. Paper presented at the Joensuu University Learning and Instruction Symposium 2005, Joensuu, Finland. (ERIC Document Reproduction Service No. ED490661)
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.
- Rosenthal, B., & Marx, R. D. (1979). Modeling influences on the eating behavior of successful and unsuccessful dieters and untreated normal weight individuals. *Addictive Behaviors, 4*, 215-221. doi:10.1016/0306-4603(79)90030-3
- Shieh, K., & Lai, Y. (2008). Effects of ambient illumination, luminance contrast, and stimulus type on subjective preference of VDT target and background color combinations. *Perceptual and Motor Skills, 107*, 336-352.
- Sussman, R., & Gifford, R. (2012). Please turn off the lights: The effectiveness of visual prompts. *Applied Ergonomics, 43*(3), 596-603.
- Sussman, R., Greeno, M., Gifford, R., & Scannell, L. (2013). The effectiveness of models and prompts on waste diversion: A field experiment on composting by cafeteria patrons. *Journal of Applied Social Psychology, 43*(1), 24-34.
- Thrasher, J. F., Besley, J. C., & González, W. (2010). Perceived justice and popular support for public health laws: A case study around comprehensive smoke-free legislation in Mexico City. *Social Science & Medicine, 70*, 787-793. doi:10.1016/j.socscimed.2009.10.064

- Thurber, S., & Snow, M. (1980). Signs may prompt antisocial behavior. *Journal of Social Psychology, 112*, 309-310.
- United Nations Statistics Division. (2007). *Environmental indicators and selected time series: Municipal waste collection*. Retrieved from <http://unstats.un.org/unsd/ENVIRONMENT/qindicators.htm>
- United States Environmental Protection Agency. (2008). *Composting: Environmental benefits*. Retrieved from <http://www.epa.gov/waste/conserve/rrr/composting/benefits.htm>
- Van Meurs, L., & Aristoff, M. (2009). Split-second recognition: What makes outdoor advertising work? *Journal of Advertising Research, 49*, 82-92. doi:10.2501/S0021849909090011
- Wagstaff, M. C., & Wilson, B. E. (1988). The evaluation of litter behavior modification in a river environment. *Journal of Environmental Education, 20*, 39-44.
- Werner, C. M., Rhodes, M. U., & Partain, K. K. (1998). Designing effective instructional signs with schema theory: Case studies of polystyrene recycling. *Environment and Behavior, 30*, 709-735. doi:10.1177/001391659803000506
- Werner, C. M., White, P. H., Byerly, S., & Stoll, R. (2009). Signs that encourage internalized recycling: Clinical validation, weak messages and "creative elaboration." *Journal of Environmental Psychology, 29*, 193-202.
- Williams, L. E., & Bargh, J. A. (2008). Experiencing physical warmth promotes interpersonal warmth. *Science, 322*, 606-607. doi:10.1126/science.1162548
- Williams, M., Thyer, B. A., Bailey, J. S., & Harrison, D. F. (1989). Promoting safety belt use with traffic signs and prompters. *Journal of Applied Behavior Analysis, 22*, 71-76. doi:10.1901/jaba.1989.22-71
- Wogalter, M. S., Begley, P. B., Scancorelli, L. F., & Brelsford, J. W. (1997). Effectiveness of elevator service signs: Measurement of perceived understandability, willingness to comply and behaviour. *Applied Ergonomics, 28*, 181-187. doi:10.1016/S0003-6870(96)00063-4

Author Biographies

Reuven Sussman is a PhD candidate at the University of Victoria conducting research in social and environmental psychology. He is specifically interested in field research employing social-psychology theories to promote proenvironmental behavior.

Robert Gifford is professor of psychology and environmental studies at the University of Victoria. A fellow of the American and Canadian Psychological Associations and the Association for Psychological Science, he is the author of four editions of *Environmental Psychology: Principles and Practice*.