

# ENVIRONMENTAL REVIEWS AND CASE STUDIES

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## Changing Norms by Changing Behavior: The Princeton Drink Local Program

Jessica M. Santos, Sander van der Linden

**Unprecedented levels of global bottled water consumption present a major challenge for the environment and water conservation initiatives. Educational institutions are in a unique position to promote conservation behavior by signaling pro-environmental norms. To decrease disposable bottled water consumption on campus, Princeton University instituted an innovative “Drink Local” program in 2009. The program provides reusable water bottles to all incoming students and we analyze the program’s impact here by drawing on behavioral and social influence research. In particular, we hypothesized that by signaling that the desired “prototypical” behavior of Princeton students should be “sustainable,” students would be less likely to consume bottled water on one hand, and more likely to offer normative support for a campus bottled water ban on the other. Results from a quasi-experiment involving over 1,300 students confirm our hypotheses; students who received the reusable Drink Local bottles upon arrival to Princeton are significantly less likely to drink disposable bottled water and more likely to support a campus-wide bottled water ban. These results are promising for educational institutions who wish to promote water conservation behavior on campus and beyond.**

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**A**lthough safe and clean tap water is provided at little to no cost in most developed countries, the global consumption of bottled water reached a historical all-time high in 2014, totaling over 11 billion gallons in the United States alone (Beverage Marketing Corporation [BMC], 2014). This is occurring during a time in which over 40% of the world’s population lacks basic access to safe and clean

drinking water (World Health Organization [WHO], 2014). Water scarcity is affecting nearly every continent in the world (Food and Agriculture Organization [FAO], 2013) and is likely to be intensified by the impacts of climate change (Mann and Gleick, 2015). Out of all environmental issues, Americans consistently worry most about water security (Gallup, 2015). Consequently, water conservation is becoming an increasingly important item on the public policy agenda (Russell and Fielding, 2010).

From a public health perspective, there is little to no evidence to suggest that bottled water is any safer or healthier than regular tap water (Azoulay, Garzon, and Eisenberg, 2001; Copes, Evans, and Verhille, 2009; Raj, 2005). Moreover, bottled water companies do not have to adhere to the same quality control standards as public drinking water sources (Government Accountability Office [GAO], 2009). The rapidly increasing global consumption of bottled water also contributes to a multitude of environmental problems, including water scarcity, environmental pollution, and climate change. In fact, although most PET (polyethylene terephthalate) water bottles are recyclable, only about a third of all water bottles produced in the United States were actually recycled in 2012 (National Association for PET Container Resources [NAPCOR], 2013). Because of this, a majority of the waste goes to landfills or is abandoned as litter on land or in bodies of water, contributing to major environmental issues such as the “Pacific trash vortex” (National Oceanic and Atmospheric Administration [NOAA], 2016). In addition, the production of bottled water is inefficient and water intensive: on average, it takes about 3 liters of regular water to produce 1 liter of bottled water (Pacific Institute [PI], 2007). Moreover, Gleick and Cooley (2009) estimate that the production and shipping of bottled water requires about 2,000 times the energy needed to supply regular tap water.

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*Affiliation of authors:* Jessica M. Santos, Office of Sustainability, MacMillan Annex West, Princeton University, Princeton, New Jersey; Sander van der Linden, Department of Psychology, Woodrow Wilson School of Public Affairs and Andlinger Center for Energy and the Environment, Princeton University, Princeton, New Jersey.

*Address correspondence to:* Sander van der Linden, Department of Psychology, 421 Peretsman-Scully Hall, Princeton University, Princeton, NJ 08544; (phone) 609-258-6935; (e-mail) sander.vanderlinden@princeton.edu.

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## Insights from Behavioral Science: Reducing Bottled Water Consumption

Water conservation research has generally received relatively little attention in the applied psychology literature (Russell and Fielding, 2010; Osbaldiston & Schott, 2012). Moreover, behavioral research on bottled water consumption is virtually non-existent (van der Linden, 2013). Surveys have revealed that preferences for bottled water are largely driven by organoleptic factors (e.g., taste, odor), beliefs about quality and health benefits, lifestyle and convenience factors, and lack of perceived alternatives to drinking bottled water (Anadu and Harding, 2000; Doria, 2006; Doria, Pidgeon, and Hunter, 2005; Gorelick et al., 2011; Hu, Morton, and Mahler, 2011; Saylor, Propoky, and Amberg, 2011) while concerns about the environment play a more peripheral role (van der Linden, 2013).

Most water conservation campaigns have traditionally relied heavily on information-based approaches to encourage positive behavior change. Yet, the results of such educational campaigns are often mixed at best (Syme, Nancarrow, and Seligman, 2000). The “public deficit” model is based on the pervasive notion that simply exposing people to information will encourage pro-environmental beliefs, attitudes and norms, which in turn, will lead people to adopt more sustainable behaviors (Kollmuss and Agyeman, 2002; Mildenberger et al., 2013; van der Linden, 2014).

In contrast, more recently, scholars have suggested that instead of merely providing people with educational information, community-based social marketing campaigns might be more effective tools for promoting conservation behavior (e.g., McKenzie-Mohr, 2000; Mildenberger et al., 2013; O'Donnell and Rice, 2012), particularly because they “market” normative information to large audiences. Although the persuasive effects of conveying information about the sustainable behavior of social referents have been well-documented (Cialdini, Kallgren, and Reno, 1991; Miller and Prentice, 2016; Goldstein, Cialdini, and Griskevicius, 2008; van der Linden, 2013), one key area of social influence research that has received much less attention is the notion of “institutional” norm-signaling (Tankard and Paluck, 2016). Much like any social norm, an institution’s “decisions or innovations signal what behaviors are common or desired within a group” (Tankard and Paluck, 2016, p. 10). Institutional norm-signaling can alter perceptions of a given norm both directly as well as indirectly. Indirect adjustments typically occur because people perceive a change in the incidence rate

of a given behavior due to institutional factors, which is then assumed to change their understanding of the norm (Tankard and Paluck, 2016). People may also infer that the direction of the institutional change is in line with larger societal norms. Yet, the causal process underlying institutional norm-signaling (i.e., whether norm-signaling can actually lead to changes in norm perception) has not been studied in much detail (Tankard and Paluck, 2016).

One important mechanism through which norm-signaling can influence behavior is by setting “anchor” or “default” choices for the group (Thaler and Sunstein, 2008). By suggesting or anchoring a particular behavioral choice for the group (e.g., a reusable bottle), the majority is likely to accept the behavior, as behavioral research has shown that it takes more cognitive effort to adjust away from the default (Tversky and Kahneman, 1974). Moreover, in addition to “nudging” people directly to adopt a pro-environmental behavior (e.g., by providing reusable bottles), institutional norm-signaling might also induce social conformity if people infer that the institution has set the respective behavior as the anchor because it is a desirable or prototypical behavioral choice for the group. In the present research, we evaluate institutional norm-signaling as a potential vehicle for social change through an empirical case study: The Princeton Drink Local Program.

### The Princeton Drink Local Program

The Princeton University Office of Sustainability launched the “Drink Local” program in 2009 to reduce the number of disposable water bottles purchased on campus by decreasing student demand for them. The Office of Sustainability has provided the majority of incoming undergraduate and graduate students with BPA-free Princeton-branded reusable bottles (Figure 1). Undergraduates specifically receive so-called “Sustainability Survival Kits,” which include the reusable Drink-local bottle as well as a durable plastic spork and information about getting involved in sustainability initiatives on campus (Figure 1). This effort has been paired with an institution-wide effort to replace outdated sinks and water fountains with over 200 refurbished filtered water stations in campus residence halls and academic, administrative, and athletic buildings, as of 2015.

Since the program’s inception in 2009, the Office of Sustainability decided to invest in durable Nalgene bottles (in 2015, the Office paid \$10.80 per bottle). These bottles were initially financed by the High Meadows



**Figure 1.** Sustainability Survival Kits provided to incoming freshmen at Princeton.

Sustainability Fund, which funds proposals for sustainability projects on Princeton's campus that have measurable outcomes and result in culture change. In 2012, the Office began to provide Drink Local bottles to graduate students as well. To assess the program's impact on perceived norms and behavior, we conducted a university-wide survey.

## Methods

### Participants

The University conducted a large survey among Princeton undergraduate students in April and May of 2015. Office of Sustainability interns e-mailed electronic mailing lists, or "listservs" associated with each residential college (multiple times). A total of  $N = 1,302$  responses were received. Unfortunately, the Office of Sustainability does not have access to the number of subscribers for each residential college mailing list. Thus, although official response rates could not be determined, during the 2015 spring semester, 3,134 undergraduates were living in the residential college system. We therefore estimate the response rate to be roughly  $(1,302/3,134)$  around 42%.

### Procedure

Students received an email that advertised the opportunity to win a \$50 gift card to a campus café by participating in a short survey. In the email, students were asked to click on a web link that directed them to the study. The duration

of the survey was around 5 minutes and the structure was as follows: Respondents were first asked to provide their class year and Princeton ID (to be used for the drawing), followed by questions asking if they received a Drink Local bottle upon their arrival to Princeton and if so, if they still have their bottle. Next, respondents were asked about how often they use a Drink Local bottle, use another reusable bottle, and how frequently they purchase disposable bottled water (if at all). They were then asked about common barriers to using the reusable water bottles. Finally, respondents were asked whether they believe Princeton University should or should not sell bottled water.

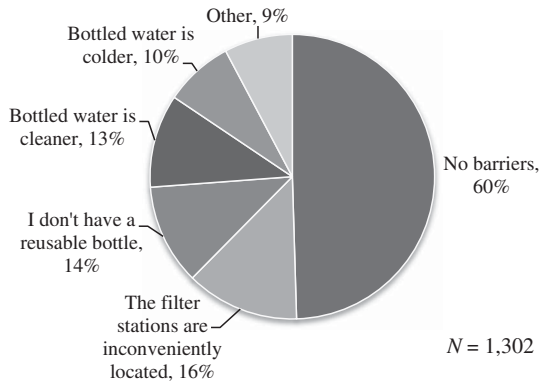
## Measures

### Behavior

The behavior-based measure was presented as a single-item statement describing the frequency of disposable bottled water consumption. Using a four-point scale, respondents were asked to rate the frequency with which they purchase disposable bottled water (1 = *Never*, 2 = 1–2 *times per week*, 3 = 3–5 *times per week*, 4 = 6+ *times per week*).

### Perceived Barriers

Barriers about using the Drink Local bottle were presented as an eight-item checklist that allowed for multiple responses (e.g., "I think that bottled water is cleaner").



**Figure 2.** Perceived barriers to using the Drink Local bottle.

### Prescriptive Norm: Disposable Bottled Water Ban

The final question in the survey asked students to select the statement that they agreed with most: if Princeton *should*, or *should not*, sell bottled water. The binary-answer format (0/1) was used to force participants to choose a response.

## Results

### Drink Local Bottle Ownership and Usage

Among all respondents, roughly 68% ( $N = 881$ ) stated that they had received a Drink Local bottle, roughly 27% ( $N = 348$ ) said that they had not, and roughly 5% ( $N = 73$ ) stated that they did not remember receiving one. Of those who received a Drink Local bottle, about 50% ( $N = 444$ ) reported that they still had it. The distribution of those who received (and still own) a Drink Local bottle varied by class year (2011–14), with a positive skew toward freshmen (48%) vs. sophomores/juniors (30%) and seniors (14%). Additionally, 60% ( $N = 785$ ) of survey respondents stated that they did not perceive barriers to using their Drink Local bottle or another reusable bottle (Figure 2). The most common barrier (16%;  $N = 204$ ) that prevented students from using their bottles was that filtered water stations are inconveniently located. Other barriers mainly included taste and health preferences for bottled water.

### Drink Local's Effect on Disposable Bottled Water Consumption

We evaluated the relationship between ownership of the Drink Local bottle and stated bottled water consumption. The sample was comprised of students who received (Group 1;  $N = 881$ ) and students who did not receive a Drink Local bottle (Group 2;  $N = 421$ ). Main results are tabulated in

**Table 1.** The frequency of bottled water purchases per week by students who received a Drink Local bottle (Group 1) and students who did not receive a bottle, or did not remember receiving a bottle (Group 2).

Frequency of Disposable Bottled Water (Purchases per Week)					
Received Drink Local Bottle	Never	1-2 times per week	3-5 times per week	6+ times per week	Total
Group 1 "yes" ( $n = 881$ )	66.5%	24.0%	6.9%	2.6%	100%
Group 2 "no" ( $n = 421$ )	57.0%	29.7%	8.8%	4.5%	100%
Total ( $N = 1,302$ )	63.4%	25.8%	7.5%	3.2%	100%

further detail below (Table 1). Overall, results show that distributing Drink Local bottles to incoming students was correlated with reduced bottled water consumption. Group 2 students are significantly more likely to state that they purchase bottled water more frequently than Group 1 students across all categories,  $\chi^2(3) = 12.21$ ,  $p = 0.01$ . Cramer's  $V = 0.10$ . A t-test (unequal variances assumed) revealed a similar result, compared to Group 1, mean bottled water consumption was significantly higher for Group 2,  $t(747) = -3.02$ ,  $p < 0.001$ , Cohen's  $D = 0.20$ . Yet, the true magnitude of the difference might be masked (i.e., lowered) by students who initially received a Drink Local bottle, but no longer have one.

We therefore further analyzed bottled water purchasing habits between students who still had their bottle (Group 1), students who no longer had their bottle (Group 2), and students who never received a bottle (Group 3). An ANOVA revealed that Group 1 students were significantly less likely [ $F(2, 1299) = 8.68$ ,  $p < 0.01$ ] to purchase disposable bottled water compared to their Group 2 and 3 counterparts. Post-hoc comparisons using a Bonferroni adjustment indicate that the mean consumption score for Group 1 students ( $M = 1.38$ ,  $SD = 0.69$ ) is significantly ( $p < 0.05$ ) lower compared to both Group 2 ( $M = 1.56$ ,  $SD = 0.80$ ) and Group 3 ( $M = 1.58$ ,  $SD = 0.82$ ). Results are shown in Table 2 and suggest that the (large) positive effect on behavior persisted only among students who still had their Drink Local bottle.

### Drink Local and Its Effect on Normative Support for a Campus Bottled Water Ban

Last, we found a significant association between receiving a Drink Local bottle and normative support for banning bottled water on campus ( $\chi^2 = 5.33$ ,  $p = 0.02$ , Cramer's  $V = 0.07$ ). Approximately 57% of students who received a

**Table 2.** Relationship between Owning a Drink Local Bottle and Bottled Water Consumption.

Drink Local Bottle Ownership	Never	1-2 times per week	3-5 times per week	6+ times per week	Total
Still have my Drink Local bottle ( <i>n</i> = 444)	71.6%	20.3%	6.3%	1.8%	100%
No longer have my Drink Local bottle ( <i>n</i> = 556)	59.5%	28.6%	8.1%	3.8%	100%
Never received a Drink Local bottle ( <i>n</i> = 302)	58.6%	28.8%	8.3%	4.3%	100%
Total ( <i>N</i> = 1,302)	63.4%	25.8%	7.5%	3.2%	100%

$\chi^2(6) = 13.01, p < 0.05.$

**Table 3.** The Relationship between Receiving a Drink Local Bottle and Normative Support for a Bottled Water Ban.

Received Drink Local Bottle	Prescriptive Norm: Campus Bottled Water Ban		Total
	Princeton SHOULD sell bottled water	Princeton SHOULD NOT sell bottled water	
Received a Drink Local bottle ( <i>n</i> = 656)	43.4%	56.6%	100%
Did not receive a Drink Local bottle ( <i>n</i> = 330)	51.2%	48.8%	100%
Total ( <i>N</i> = 986)	46.0%	54.0%	100%

Drink Local bottle stated that Princeton University should NOT sell bottled water, as compared to approximately 49% of students who did not receive a Drink Local bottle.<sup>1</sup> Main results are displayed in Table 3.

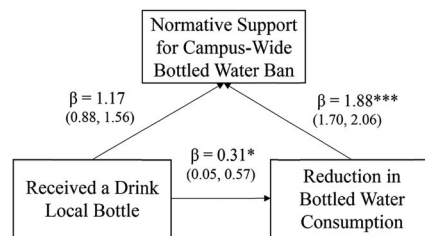
### Institutional Norm-Signaling Hypothesis

We tested a binary mediation model where possession of a Drink Local bottle was regressed on normative support for a bottled water ban with self-reported bottled water consumption as the mediator (Figure 3). Results indicate that when controlling for bottled water consumption, the association between receiving a Drink Local bottle and normative support is no longer significant. In other words, the relationship between receiving a Drink Local bottle and normative support for a bottled water ban is fully mediated by (less) consumption of bottled water (i.e., normative support increases as a result of a change in the incidence rate of behavior, which in turn, is predicted by ownership of a DL bottle).

## Discussion

### Institutional Norm-Signaling: Drink Local and Its Effect on Support for a Campus Bottled Water Ban

One important area of social influence research for which empirical evidence has been scarce revolves around the



\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .  $N = 986$ . Coefficients predicting normative support are odds-ratios (OR). 95% confidence intervals are provided in parentheses.

**Figure 3.** Norm-Signaling Behavior (NSB) Mediation Model.

efficacy of “institutional” norm-signaling (Tankard and Paluck, 2016). This is surprising, as educational institutions are in a unique position to implement, promote, and signal desirable social and pro-environmental norms to their communities. In fact, the internalization of pro-environmental norms is often necessary for behavior change to be sustained in the long-term (van der Linden, 2015). The Princeton Drink Local program is a successful and innovative example of how universities can communicate and signal a desirable social norm by making sustainable choices (i.e., reusable bottles) the default and desired prototypical behavior for the group. This research provides useful and important preliminary insights into the causal process behind norm-signaling approaches and whether such initiatives can actually alter norm-perception. In particular, this study shows that years after students received the Drink Local bottle, they were more likely to support the normative statement that “Princeton should not sell bottled water,” as compared to students who never received the Drink Local bottle. Importantly, our analysis shows that this effect was fully mediated by the indicate rate of bottled water consumption. Students who previously received the Drink Local bottle were less likely to purchase bottled water (or less frequently), which, in turn, increased normative support for a disposable bottled water ban on campus. These results suggest that providing students with reusable water bottles upon their arrival will positively influence their beliefs about an institutional

decision not to sell disposable bottled water. This relationship is particularly promising for institutions that want to lay the groundwork for a campus bottled water ban (e.g., see Ban the Bottle, 2015). The Drink Local program shows strong potential for building community support for such initiatives. Lastly, these results highlight that it is not always necessary to change attitudes in order to change behavior. In fact, the Princeton Drink Local program encourages behavior change first, which results in subsequent normative support for green institutional decisions (i.e., “changing norms by changing behavior”).

### Drink Local’s Effect on Disposable Bottled Water Consumption

In practical terms, results demonstrate that providing incoming students with reusable water bottles is significantly associated with reduced self-reported bottled water consumption on campus. Importantly, however, if students lose the bottle, they are likely to return to purchasing disposable water bottles. Overall, these results suggest that there is a significant opportunity for colleges and universities to reduce their bottled water consumption by instituting “Drink Local” programs that provide students with reusable water bottles upon their initial arrival to the school. Although a majority of the students did not perceive any major barriers to using their reusable bottle, results also suggest that ensuring that water fountains are conveniently located on campus is important to facilitate regular use of the bottle and to disincentive unsustainable alternatives (i.e., simply buying a bottle of water instead).

### Limitations

Although a strength of the current design is that we evaluated behavior and normative support after students received the Drink Local bottle, we were unable to control for the actual time elapsed between distributing the bottles and administering the survey (which ranges between 7 months and 4 years). Future studies could improve impact evaluations by employing a within-subject design—that is, by surveying beliefs and behaviors at the time when the reusable bottle is provided and by re-contacting the same students at systematic intervals thereafter (e.g., 1 year, 3 years etc.) so that changes in norms and behavior can be tracked dynamically over time. Recognizing the limitations of self-reported behavior (Kormos and Gifford, 2014), future studies may also consider using indicators of observed behavior (e.g., bottled water sales). Lastly, although we leveraged a quasi-experimental design (i.e., naturally occurring groups of students who did and did not receive the Drink Local bottle),

any causal claims must be interpreted with caution. For example, it is possible that students with prior sustainable attitudes were more likely to respond to the survey and to use and retain the bottle in the first place. Accordingly, future program evaluations may benefit from employing controlled randomized experimental trials.

## Conclusion

The Princeton Drink Local Program distributes reusable water bottles to incoming students. For the first time since the program’s formation, we surveyed a large sample of university students to quantify the program’s impact on behavior and normative beliefs. We find that the program is innovative in its ability to change norms by changing behavior; students who receive a Drink Local bottle are significantly less likely to purchase bottled water, which, in turn, increases normative support for a disposable bottled water ban on campus. The demonstrated potential of this approach makes it a feasible and scalable strategy for other institutions who wish to promote sustainability on campus.

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## Note

1 Students who answered “no opinion” were excluded from this analysis.

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