

## Promoting plastic bottle recycling and reducing in a university campus in the Middle East

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## Intervention / Case Study Submission

### Promoting plastic bottle recycling and reducing in a university campus in the Middle East

#### Background/justification of the problem

In Lebanon, every year, the population produces more than 2,000 tons of municipal solid waste (MSW), 55% of which are organic, mostly food waste (Abiad and Meho, 2018), and 37% are recyclables (Halwani et al., 2020). However, only 8% of these materials are recycled (Abbas et al., 2017). Due to the lack of comprehensive, nationwide solid waste management strategies, individuals result in the extensive use of satellite landfills, incineration sites, open dumping, and burning of trash (HRW, Human Rights Watch, 2020). Considering the grave consequences on the environment and the health of citizens, local municipalities and other community-based, non-governmental organizations have been devolved the responsibility of managing waste, following a decentralized model (Massoud et al., 2019).

Similarly, the American University of Beirut (AUB), the oldest, private, non-sectarian academic institution in Lebanon, has managed its waste since the early 2000s. Through the Department of Environmental Health Safety and Risk Management (EHSRM), the university actively encourages its community to adopt the Rs (Reduce, Reuse, Recycle) and follow sustainability principles. The EHSRM department was established to develop and implement sustainable strategies that provide and maintain a safe and healthy environment for its staff, faculty, students, and the public visiting the campus, located in the heart of the capital Beirut. In response to the nationwide waste crisis initiated in 2015 and exacerbated by the recent economic and humanitarian crises after the August 2020 Beirut port blast (Devi, 2020), the EHSRM department started a solid waste management program, including food waste composting facilities for AUB campus residents, plastic, paper, and hospital waste segregation, collected by the local non-governmental organization Arcenciel. Other initiatives to promote the 3R principles to reduce the consumption of PET bottles include the introduction of reverse vending (Reva) “boomerang” machines and water fountains in various areas of the campus (EHSRM, 2021).

Despite the numerous initiatives conducted in the past two years, recent waste characterizations and observations conducted in early 2021 revealed that the reverse vending machines were underused and primarily unknown among the students who started coming to campus during the Fall 2021 semester when the COVID-19 restrictions were partially lifted. Another service usage gap was observed for the water fountains, which provide free potable water in dorms and some campus facilities. These findings urged the EHSRM department to develop solutions to enhance the adoption of such services.

This paper reports the development, implementation, and evaluation of a pilot social marketing campaign promoting the use of Reva “boomerang” machines and water fountains among AUB campus residents. This work was developed during the Fall 2021 semester within the “Social Marketing for Public Health” graduate course offered to students enrolled in the Master of Public Health at the Faculty of Health Sciences. In this service-learning course, the students collaborate with a community partner organization (i.e., the EHSRM department) to co-develop solutions to identified problems (Bardus et al., 2021; El Harakeh et al., 2017). The students were introduced to the basic notions and principles of the social marketing planning process (Lee and Kotler, 2019), including the community-based social marketing (CBSM) framework applied to pro-environmental behaviors in various community settings (Armijo-de Vega et al., 2012; Cole and Fieselman, 2013; McKenzie-Mohr, 2011).

#### Aims and Objectives

The overarching goal of this campaign was to improve waste segregation and reduction practices among the AUB community. Specifically, this social marketing intervention was aimed at addressing two behavioral objectives: 1) increasing the consumption of water from fountains installed at AUB students’ dormitories (liters of water over time); 2) increasing the utilization of vending machines for recycling plastic bottles and cans (number of items collected over time). Both behavioral objectives were based on indicators that the EHSRM collected routinely for monitoring purposes and were aligned with the institutional strategy. In the absence of previous similar efforts in our context, we used the pilot campaign to establish a rate of change that could be used to plan future iterations.

## **Target market profile**

The target audience was the AUB community living on or accessing campus. However, we further segmented this population according to the behavioral objectives. The first segment included the students who reside in AUB dorms. The students living in dormitories were targeted because of the availability of the Reva “boomerang” machines and the water dispensers already installed in dorms. The students can contribute to the reduction of plastic bottles produced in dorms by using the available water fountains for free water, which reduces the number of water bottles purchased.

The second segment included faculty, students, and visitors, who can come to campus and use the Reva “boomerang” machines to recycle plastic bottles or aluminum cans. Since this group does not have access to water fountains, the focus was on recycling plastic bottles and cans using the boomerang vending machines located in different places around campus.

## **Systematic Planning and Citizen Orientation**

To develop this campaign, we followed the five steps of the CBSM framework (McKenzie-Mohr, 2011, 2000), which include: 1) identifying the specific target behaviors, 2) understanding behavioral barriers and benefits, 3) developing a strategy, 4) piloting such strategy, and 5) implementing an extensive scale campaign. The first three steps were based on a comprehensive analysis of available data provided by the ESHRM department and on formative research, including interviews and observations conducted among dorm residents and other campus visitors.

We conducted participant observations with the target audience, which allowed us to identify the barriers, perceived benefits, competition, and motivators for the target audience to adopt the desired behaviors and thus guided our work in creating the strategy and developing critical messages used in the campaign. Formative research revealed that water fountains were poorly used because people questioned the safety of tap water – which is generally not potable in Lebanon – and the inconvenience of remembering to carry a reusable bottle. Most of the students in dorms were aware of the location of water fountains and of the benefits of using the fountains as a convenient and reliable water source. However, they did not seem to have an extrinsic motivation to use such fountains. As for the Reva “boomerang” machines, the residents showed interest in understanding how they worked, but they were unaware of their location or the associated reward system.

## **The Social Offering**

The campaign was guided by the Theory of Planned Behavior (TPB) (Ajzen, 1991; Ajzen and Fishbein, 2010), which states that an individual’s behavior can be predicted by the behavioral intention to perform the desired behavior. In this case, the behavioral targets are multifold. They include using the water fountains, refilling a reusable water bottle, and using the Reva machine to recycle a used PET bottle or aluminum can. According to the TPB, behavioral intentions are influenced by three main constructs: the attitude toward the behavior, the perceived behavioral control, and the perceived social norms underlying the desired behavior (Kan and Fabrigar, 2017). These constructs are respectively influenced by behavioral beliefs (i.e., positive experiences about the behavior), normative beliefs (the idea that most people around the individual are approving and performing the desired behavior), and control beliefs (one’s self-efficacy and the ability to control the behavior) (Ajzen and Fishbein, 2010). The social offering included the promotion of tangible products and services, such as the existing Reva “boomerang” machines and water fountains. The campaign included messages that address each of the constructs of the TPB.

## **Competition Analysis**

The main competing behaviors in this campaign were consuming water from single-use PET bottles and not recycling them, throwing them in general municipal waste bins. Formative research revealed that the Reva “boomerang” machines were hindered by a lack of visibility and awareness about the purpose of this service and the inability to see a value in sorting plastic bottles and aluminum cans. Additionally, the Reva machines used a coupon-based incentive system, in collaboration with a local grocery store chain, that was outdated.

The primary competing behavior for water fountains was mainly due to water safety concerns. A significant competitor was the PET bottle industry, which makes the product readily available on campus and outside. The absence of tangible benefits and the limited culture and openness towards recycling were considered further.

## **Integrated Intervention Mix**

Our intervention was based on the ‘classic’ marketing mix as follows:

**Product:** The first behavioral objective was to use the Reva “boomerang” machines. The core product is about the valuable benefits of using the reverse vending machine, which includes protecting the environment and human health by reducing the number of plastic bottles and cans in the background and saving sea animals from eating plastic,

becoming a responsible citizen, and being part of the global environment protectors. The actual product is the use of the reverse vending machine for recycling plastic bottles and cans. The augmented product is coupons and redeemed gifts from using the reverse vending machines that encourage using the reverse vending machines and the actual installed reverse vending machines themselves, which help perform the behavior. The second behavioral objective was to use water fountains. In this case, the core product is protecting the environment and human health. The actual product is drinking water from the water fountains installed in students' dorms. The augmented product is the installed fountains that help in performing the behavior.

**Price:** The price strategy focused on reducing non-monetary costs and increasing the desired behaviors' non-monetary and monetary benefits. For the Reva “boomerang” machines, we promoted non-monetary incentives such as protecting the environment, becoming responsible citizens, and contributing to environmental protection. For the water fountains, the non-monetary costs were the perceived efforts in performing both behavioral targets; the monetary cost was the costs of reusable water bottles. The EHSRM provided reusable water bottles, which were available from previous initiatives to address these. Non-monetary benefits included the monetary benefit of using water fountains (i.e., saving money to purchase bottled water).

**Place:** The place is when and where the target audience performs the desired behavior, so the dormitories and the areas where the Reva “boomerang” machines are placed. To make the Reva “boomerang” machines and water fountains more visible, we produced maps highlighting the devices' location on campus.

**Promotion:** We addressed the attitude towards behavior through messages that ensure the safety of water and messages that show a tangible impact of the desired behavior on the individual level (e.g., save money) and the environmental group (e.g., protect the environment). We developed messages to address the barriers identified in the formative research phase. We created posters (see Figures 1-4 below) used in print and social media. Precisely, posters were placed near water fountains to highlight the monetary benefits of using them. Additionally, we added signs indicating the location of the nearest water fountain on every floor of each dorm. We disseminated posters via email by the Student Housing Office among dorm students. The posters advertising the Reva “boomerang” machines were distributed in the same buildings.

**Implementation and evaluation:** The campaign was piloted in 8 dorms for a week between the first and third week of December 2021. One engineering building was considered the control as it did not receive the intervention but had an old water fountain. We evaluated the impact of our pilot campaign using a before-after, quasi-experimental design. We compared the volume of water distributed through fountains and the number of recyclables collected through the Reva “boomerang” machines before and after the intervention. We compared the intervention data with the control building using a Difference In difference Model (DID) model (Wing et al., 2018), based on a before-after quasi-experimental design. The campaign resumed in early 2022. Below we report the cumulative data related to the Reva machines and water fountains available on campus, as published in the last five monthly EHSRM newsletters.

## Results and Learning

Although our pilot campaign lasted only 7 days, as it had to be completed before the end of the Fall semester, data showed a 47% increase in water consumed in 6 out of the eight intervention buildings; the water diminished by 8% in the control building. According to the difference-in-differences approach, the pilot intervention produced an overall 53% increase in water consumed through water fountains in the targeted buildings.

*Table 1. Liters of water consumed in fountains during the pilot campaign in the intervention buildings and control building*

<b>Building</b>	<b>Before</b>	<b>After</b>	<b>% change (after-before/before)</b>
Penrose	53,060.5	60,095.5	13%
Boustani	50,776.5	71,608.0	41%
Jewett	51,318.5	202,439.5	294%
Kerr Hall Men	7,223.5	7,127.5	-1%
Kerr Hall Women	3,883.0	4,960.0	28%

Building	Before	After	% change (after-before/before)
New Women's Dorm	52,910.5	67,764.5	28%
RGB	338.0	381.5	13%
SRB	975.5	917.5	-6%
Bechtel (control)	3,417.5	3,159.0	-8%

Comparing the cumulative data across campus (see Table 2), before and after the campaign, between November and January 2022, there was an increase of 34% in liters of water consumed on campus, and 0.8% increase in plastic bottles collected through Reva machines.

Table 2. Cumulative number of liters of water consumed on campus and plastic bottles/cans collected using Reva machines

Data collection period	Water fountains		Reva “boomerang” machines	
	Liters consumed (absolute)	% difference	Bottles and cans collected (absolute)	% difference
Jul-21	433,482.0 (--)		1,242,671 (--)	
Sep-21	507,551.5 (74,069.5)	17.09%	1,243,050 (379)	0.03%
Nov-21	655,548.0 (147,996.5)	29.16%	1,252,643 (9,972)	0.80%
Jan-22	753,960.5 (98,412.5)	15.01%	1,254,106 (1,463)	0.12%
Mar-22	919,326.0 (165,365.5)	21.93%	1,255,567 (1,451)	0.12%

The pilot campaign was done at end of the semester, a time when the campus activity is reduced, so that is why we could not see a steep increase in recyclables collected through the Reva “boomerang” machines. Nevertheless, the campaign was resumed in the following months, with posters distributed across campus and diffused through social media. The continued efforts seem to have maintained high levels of water consumption and slightly increased the number of plastic bottles and cans collected through the Reva machines.

### Conclusions and Recommendations

Our social marketing campaign promoting the use of water fountains and reverse vending machines to reduce plastic bottle consumption on campus was effective in creating short-term behavior change. To enhance the reach and ascertain the sustainability of this campaign, the EHSRM department should involve several stakeholders such as the Office of Student Affairs the Housing department, and student clubs, who can promote and reinforce the messages throughout the academic year. Lastly, qualitative data could be collected to gather feedback about the Reva machines and water fountains, to understand how the intervention could be improved.

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Appendices

Figure 1. Poster showing the location of Reva “boomerang” machines

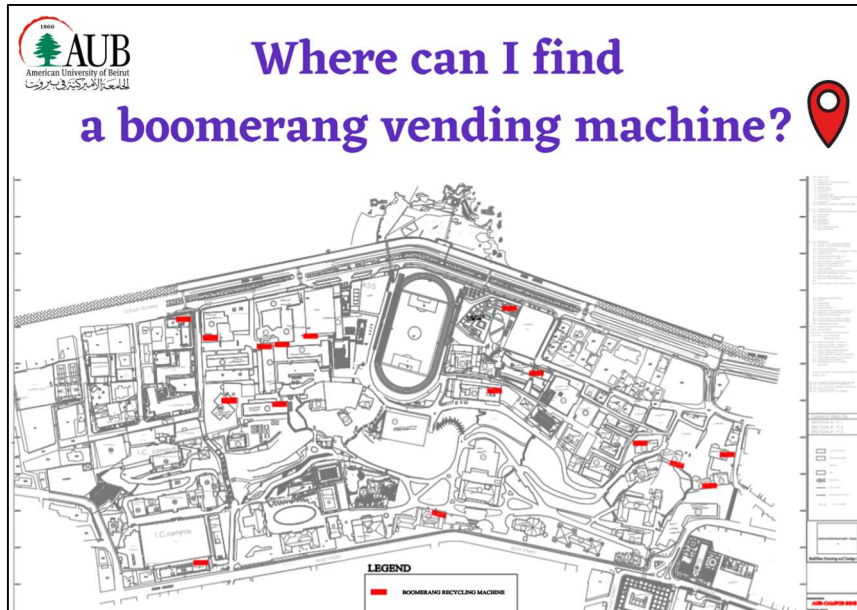


Figure 2. Poster promoting the intangible environmental benefits of the Reva machines



Figure 3. Poster promoting the safety of water fountains



Figure 4. Posters promoting the monetary and non-monetary benefits of using water fountains

