

Memes Save Recycling?
Reducing Contamination and Increasing Recycling through Meme-Based Behavioural Interventions

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Executive Summary

This study investigates whether cartoon-style meme signage influences recycling behaviors, specifically targeting contamination and correct recycling in Return-It bins. We compared two Return-It bin conditions at the UBC AMS Student Nest Building: an intervention bin displaying cartoon-style meme signage instructions and a control bin with traditional signage. Our study measured the number of correctly recycled items and contaminants across baseline and intervention periods. Observations were conducted daily, collecting data on 304 bottles. Results indicated no statistically significant difference between bins; cartoon-style meme signage did not significantly decrease contaminants or increase correctly recycled bottles compared to standard signage. Nonetheless, meme posters appeared to attract more attention, suggesting potential effectiveness if used in combination with other behavioral strategies. This research highlights the complexities of changing recycling behaviors using signage alone and underscores the need for integrated, multifaceted approaches for future recycling interventions.

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Introduction

Encouraging proper recycling behaviour and reducing contamination in recycling streams has become a major environmental concern as global garbage generation keeps rising. Contaminated recycling negatively impacts the efficiency of waste diversion systems and increases the burden on waste management services.

Research suggests that waste disposal decisions might be greatly affected by signage design. Wu et al. discovered that, as compared to word-only signs, visual signage including symbols enhanced sorting efficiency¹. These results highlight the possibilities of creative and visually appealing formats (e.g., cartoon-style meme signage) to guide recycling behaviour.

In our study, cartoon-style meme signage is defined as posters that incorporate humorous, internet-style graphics and captions to convey correct recycling procedures. These posters are intended to combine instructional content with humorous elements (e.g., cartoon-style memes) to increase positive recycling behaviors. Research by Bonnici et al. supports this rationale, showing that humorous messages often generate greater attention and message recall compared to neutral messaging².

Namaz, Zhao, and Dowlatabadi applied similar behavioral economics principles by using reminder cards in car-sharing vehicles.³ These simple visual nudges significantly increased pre-use inspection behavior, showing that timely, salient messages can lead to meaningful behavior changes. Their success suggests that even low-cost and minimally intrusive interventions might influence public recycling habits.

Despite this promising evidence, the application of meme-based messages in waste disposal contexts remains underexplored. Our study addresses this gap by testing whether cartoon-style meme signage can decrease contamination and increase correct recycling numbers in a real-world campus setting. By examining the intersection of visual attention and behavioral nudges, our research contributes novel insights to environmental psychology and practical interventions for sustainable waste management. The importance of our experiment exists firstly to decrease the burden of UBC AMS Student Nest staff in segregating waste. Secondly, effective waste segregation can help to decrease the global warming potential by 19.96%⁴. Therefore, we are contributing to the environmental protection of society by building a sustainable model on campus.

Research Questions

How does a cartoon-style meme signage on Return-It bins influence the number of correctly sorted items and the number of contaminants?

Hypothesis

Installing cartoon-style meme signage with sorting instructions near Return-It bins will significantly increase the correct sorting and disposal of items compared to bins without signage.

Installing cartoon-style meme signs with sorting instructions near Return-It bins will significantly decrease the number of contaminants compared to bins without signage.

Participants

Since our study focused on observing the number of bottles disposed of in the Return-It bins, we did not record the number of participants. The bottles are dropped off by a mobile crowd at UBC AMS Student Nest Building, including students, faculty, staff, and visitors. A priori power analysis determined that we needed a minimum sample of 788 bottles to detect an effect size of $F = 0.2$, assuming $\alpha = 0.05$ and power = 0.8. By the end of our experiment, we had collected data from 304 bottles before and after the intervention for both the experimental and control groups.

Conditions

This experiment contained two independent variables. The first independent variable was the bin type. Our intervention bin had a cartoon-style meme-based signage posted on it, while the control bin did not have any manipulation. The second independent variable was the period, which was categorized into the baseline period and the intervention period. Therefore, our experiment consisted of four conditions. Specifically, the baseline period has the experimental group ($N = 35$) with 0 contaminations and the control group ($N=14$) with 2 contaminations. Similarly, the intervention period has the experimental group ($N = 152$) with 3 contaminations, and the control group ($N=102$) with 4 contaminations. The two Return-It bins were set up in two different areas of the UBC AMS Student Nest Building. The intervention bin was located on the first floor in the Kyros kitchen, and the control bin was located on the third floor next to the washroom. The purpose of this is to enable the intervention group to be exposed to more participants, allowing for more effective observation of whether the intervention has a significant effect. We used humorous and visually appealing cartoon-style meme signage to operationalize our independent variables, aiming to decrease contamination and increase the number of correctly recycled bottles. Meme posters used in the intervention are demonstrated in Appendix A.

Measures

In our study, we defined two dependent variables. The first is the number of correctly disposed bottles, which means the empty beverage containers that were correctly placed in the Return-It bin. The second dependent variable is the number of contaminants included in

any items that are not accepted by the Return-It bin, such as food scraps, napkins, liquids, or other materials. We chose these two indicators because they clearly illustrate whether our visual cues (cartoon-style meme signage) had an impact on how people dispose of bottles, with an increase in the number of correct bottles and a decrease in the number of contaminants.

Procedure

Our experiment used the observation and counting method to collect data. This study was conducted from March 10th to March 31st. During the baseline period (March 10th-14th), we observed people's disposing behavior without intervention for both bins. After the intervention (March 15th-31st), we placed a cartoon-style meme sign on the experimental bin. The observation time was from 1:00 p.m. to 3:00 p.m. every day. For each observation shift, one experimenter was observing the intervention bin, and the other was responsible for the control bin. We recorded the number of bottles, the number of correctly recycled, and the type of contamination for both bins during the observation period. However, the control bin was not subjected to any intervention. Since the trash bags were not changed daily, we had to subtract the previous day's counts when calculating the data for each day. Therefore, to improve the accuracy and efficiency of our statistics, we put a new bag on top of the existing trash bag for a separate collection of bottles and contaminants and disposed of all the bottles into the original bag at the end of the observation shift after the calculation. This process helped us to efficiently observe the effect on the correct number of bottles and type of contamination before and after the intervention.

Result

As shown in the 2x2 contingency table for the number of contaminations (see Appendix B), a total of contaminations was recorded under four conditions. During the baseline period, 2 contaminated items were placed in the control bin, and no contaminants were in the intervention bin. In the treatment period, 4 contaminations in the control bin were determined, and 3 varied contaminants were counted in the experimental bin. In addition, the number of correct bottles was recorded in another 2x2 contingency table (see Appendix C). During the baseline period, there were 14 correct bottles in the control bin and 35 bottles in the experimental bin. After the intervention, there were 103 correct bottles recorded in the control bin and 152 bottles in the experimental bin.

Two Chi-Square tests were conducted to investigate how the number of the contaminations and number of correct bottles were affected by the cartoon-style meme signage intervention. First, in the test for the number of contaminations (see Appendix B), our result revealed no statistically significant difference between the Cartoon-style meme signage intervention and the decrease in the number of contaminations, [$\chi^2(1, N = 9) = 1.286, p = .257$]. To determine the strength of the association, which indicated by the Cramer's V, ($\phi_c = 0.378$), suggests a moderate effect size [$0.3 < \phi_c < 0.6$]. Nevertheless, our result runs contrary to the hypothesis that cartoon-style meme signage will significantly decrease the number of contaminations.

The second Chi-Square test was to determine whether the cartoon-style meme signage intervention will increase the number of correct bottles (see Appendix C). The test result analyzed no statistically significant difference between the two conditions [$\chi^2(1, N = 304) = 2.426, p = .119$]. Moreover, the Cramer's V value ($\phi_c = .089$) indicated a weak association between meme signage intervention and the number of correct bottles [$\phi_c < 0.3$], which did not support our hypotheses that cartoon-style meme signage will significantly increase the number of correct bottles.

These findings suggest that although cartoon-style meme signage was moderately associated with the number of contaminations, both results from the Chi-Square did not demonstrate a statistically significant difference.

Discussion

We found that cartoon-style meme signage did not show a statistically significant difference in decreasing the number of contaminants in the Return-It bin and increasing the number of correct bottles. Prior research suggests that humor and emotionally engaging content can enhance message recall and attention.^{1,2,3} Thus, while the intervention did not lead to measurable behavioral change in this short-term study, cartoon-style meme signage may still be a promising tool for increasing engagement with recycling messages. However, further research is needed to determine whether humor-based signage can yield consistent and long-term improvements in waste-sorting behavior.

Several factors may have contributed to the null results. During the observation period, participants often approached the Return-It bins, hesitated, and then disposed of bottles incorrectly. This situation happened in both the control bins and the intervention bins. This demonstrates that participants may not understand the purpose of the Return-It bin clearly and may reflect a lack of understanding of the severity of the contamination level inside the bin. Also, in a sustained environment, skilled behavior will recur repeatedly because the processes that initiate and control its execution become automated.⁵ Therefore, based on the participants' behavior during our observation period, cognitive barriers and established habits may play a more important role in determining recycling behavior than visual cues. This provides a new approach to first focus on people's habits of recycling bottles and basic knowledge about Return-It bins through a survey in future experiments, and then design corresponding meme signage. Simultaneously, cartoon-style meme signage may be more effective when paired with concise and engaging text prompts, which can help promote understanding of the circular economy.²

This study also faced several limitations. The total number of observed bottles ($N = 304$) was significantly lower than our target ($N = 788$), which decreased the statistical power of the analysis. Additionally, the intervention bin was located inside Kyros Kitchen, which limited exposure to a narrower population (mainly restaurant patrons) and may have deterred others from engaging with the bin. In future studies, we recommend placing bins in equally accessible, high-traffic, and neutral locations to minimize location-based confounds. To avoid cross-condition interference, such as participants being drawn to the meme poster and using the intervention bin regardless of their original disposal location, we recommend placing the control and intervention bins farther apart, ideally on different floors. While short-term results were limited, the use of cartoon-style meme signage holds potential as part of a broader intervention strategy. Future studies should explore longer-term implementations,

larger sample sizes with diversity, and integration with other behavioral tools to foster sustained, environmentally responsible habits.

Recommendations for the UBC client

Our research demonstrated that cartoon-style meme signage enhanced recycling behaviors among students, although these improvements were not statistically significant. This suggests that the observed changes could have occurred by chance. Several factors could explain this result. The experiment lasted three weeks, from March 10 to March 31, 2025, and included 16 days of intervention. The limited duration of our meme display may not be enough to significantly change the ingrained behaviors of participants. Next, the placement locations may not have optimized visibility, especially as the entrance adjacent to the Return-It bin was closed, restricting exposure mostly to students dining at Kyros Kitchen. Furthermore, many students might already have an understanding of recycling practices, therefore reducing the likelihood of significant performance improvement.

Considering these limitations, our study demonstrates that attractive, engaging signage can effectively capture student attention and encourage better recycling practices when matching the surrounding factors. Cartoon-style meme signage resonates more strongly with students than traditional signage, particularly when incorporating current trends and humor. Based on these insights and aligned with UBC's Zero Waste Action Plan 2030: Towards a Circular Economy, we suggest the following practical recommendations for the AMS Sustainability Team.

Firstly, actively engage in the creation of new meme designs regularly. Using surveys to tailor these designs to the interests and humor of UBC students. Combine humor with explicit social norms and practical instructions by using catchy slogans like, “Look how I empty my bottles before throwing them in the Return-It bin, very demure, very mindful.” This approach utilizes humor paired with relatable student behaviors to promote positive recycling actions through peer influence. Regular updates to these designs will keep the content fresh and encourage continuous student interaction.

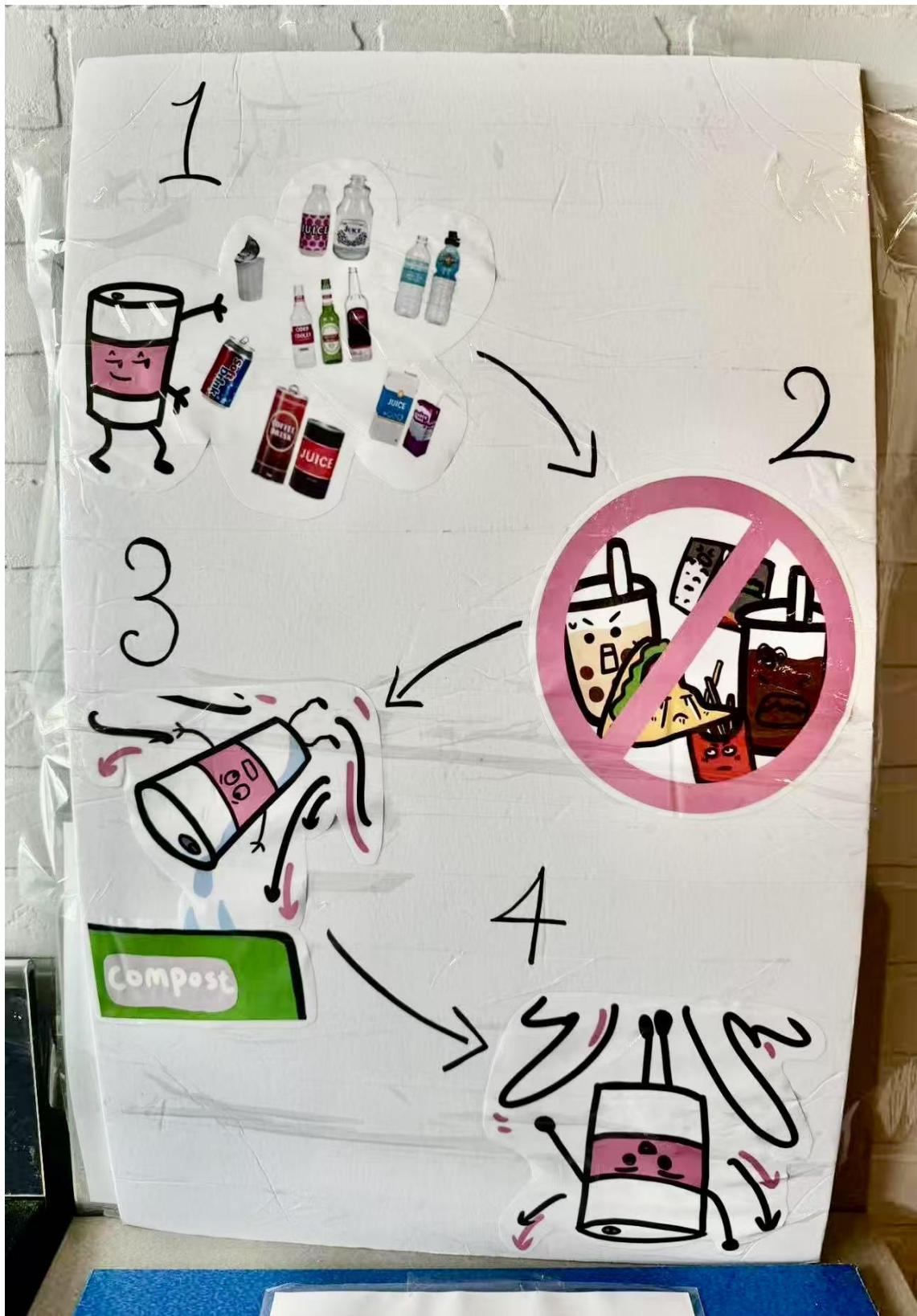
Next, strategically place these signs in locations with high foot traffic, particularly near exits of dining areas or along frequently traveled corridors. This positioning ensures maximum visibility and effectiveness in capturing students’ attention at critical points.

Lastly, conduct longer, structured pilot studies. Establish clear protocols for evaluating signage effectiveness. Implement tests at various campus locations involving diverse student groups over extended periods to accurately assess impacts. This comprehensive assessment will provide valuable insights that can be used to refine and optimize the strategy before a campus-wide implementation.

References

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Appendix A: Cartoon-Style Meme Signage



Appendix B: Contingency Table and Chi-Square Test Result for Number of Contamination

Results

Contingency Tables

Contingency Tables

period		bin		Total
		control	experimental	
baseline	Count	2.000	0.000	2.000
	% within row	100.000 %	0.000 %	100.000 %
	% within column	33.333 %	0.000 %	22.222 %
treatment	Count	4.000	3.000	7.000
	% within row	57.143 %	42.857 %	100.000 %
	% within column	66.667 %	100.000 %	77.778 %
Total	Count	6.000	3.000	9.000
	% within row	66.667 %	33.333 %	100.000 %
	% within column	100.000 %	100.000 %	100.000 %

Chi-Squared Tests

	Value	df	p
χ^2	1.286	1	0.257
N	9		

Nominal

	Value
Phi-coefficient	0.378
Cramer's V	0.378

Appendix C: Contingency Table and Chi-Square Test Result for Number of Correct Bottles

Results

Contingency Tables

Contingency Tables

Period		Bin		Total
		Control	Intervention	
Baseline	Count	14.000	35.000	49.000
	% within row	28.571 %	71.429 %	100.000 %
	% within column	11.966 %	18.717 %	16.118 %
Treatment	Count	103.000	152.000	255.000
	% within row	40.392 %	59.608 %	100.000 %
	% within column	88.034 %	81.283 %	83.882 %
Total	Count	117.000	187.000	304.000
	% within row	38.487 %	61.513 %	100.000 %
	% within column	100.000 %	100.000 %	100.000 %

Chi-Squared Tests

	Value	df	p
X ²	2.426	1	0.119
N	304		

Nominal

	Value
Phi-coefficient	−0.089
Cramer's V	0.089

Appendix D: Difficulties and Challenges

In the initial design phase, we intended to use typical meme signage, which often features well-known public figures (e.g. Will Smith) or celebrities paired with humorous captions. However, after further consideration, we decided against this approach due to potential violations of image rights and personality rights. Using recognizable individual can raise legal and ethical concerns.

To avoid such issues while maintaining the humorous and attention-grabbing memes, we decided to create hand-drawn, cartoon-style meme signage. These posters incorporate internet-style, which is the type of visual and textual humor commonly found on social media platforms, and meme formats but use original illustrations rather than real people. This approach ensures that the signage remains legally and ethically appropriate, while still aiming to capture people's attention and enhance message recall through humor.

This design decision reflects our commitment to responsible research practices and ethical content creation.