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Student Research Report

Improving Waste Sorting in the AMS Nest at UBC

Prepared by: Sylvia Apostolidis, Steve Wilson, Cassi Chesher, and Joanna Tinker

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Team 3:
Improving Waste Sorting in the AMS Nest at UBC

Sylvia Apostolidis, Steve Wilson, Cassi Chesher, and Joanna Tinker

Advisor: Kate White

UBC sustainability

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Executive Summary

A plethora of research exists confirming the environmental, health and economic consequences of improper disposal of organic waste (e.g., food scraps). At the Nest, the high rate of contamination in compost bins is a significant contributor to overall organic waste generated at UBC. This is partly due to the zero tolerance of non-compostable items permitted in the compost bag that is needed to avoid diversion of the entire bag to the landfill. One person's small action does, indeed, have a big impact and a reason why this project is both suitable to a BI intervention and important for environmental, health and economic sustainability.

The target behaviour of our project is to **decrease contamination in the compost bins in the Nest**. This problem is a good fit for a behavioral insights (BI) approach as the action itself (proper sorting) is behavioural in nature. Additionally, a solution would be highly scalable and easily implemented campus-wide (and possibly beyond) for minimal cost.

Based on a review of previous waste audits conducted in the building, conversations with our project partners, and intercept interviews conducted in the Nest, we determined that confusing and inconsistent signage was the most significant barrier to proper waste sorting. Our BI project aimed to improve signage and nudge people towards better composting behaviours.

After an in-depth review of the academic literature, we determined that the BI solutions simplification, salience, cognitive load, and message framing would be most suitable in our context to design and test the following two interventions:

1. **Optimize display cases + *SALIENCE* signage:** Currently, the receptacle bins in the Nest have a 'best practice' of filling the clear display cases above the bins with examples of products permitted in each bin. However, these display cases are not optimally utilized (i.e., some display cases are half filled, some are completely empty). Hence, the first treatment condition optimized the display cases. As well, signs were mounted above the two compost bins in this intervention with the message, "STOP: Did you separate your plastics from compostable items?" and a photo of the most problematic composting error, a container with a plastic lid. This sign applied the BI tools of simplification, salience, cognitive load and messaging.
2. **Optimize display cases + *COLLECTIVE EFFICACY* signage:** The second intervention will improve the display cases as described above *and* test a collective efficacy message. Signs were mounted above the two compost bins in this intervention with graphics and messaging, including, "It takes all of us. Let's all do our part". This sign applied the BI tools of simplification, salience, cognitive load and messaging.

Our conceptual hypotheses were as follows:
H_1: Treatment #1 (Optimize display cases + *SALIENCE* signage) will decrease rates of contamination in the compost bins, compared to the control group.
H_2: Treatment #2 (Optimize display cases + *COLLECTIVE EFFICACY* signage) will decrease rates of contamination in the compost bins, compared to the control group.

We conducted a quasi-experimental pre-test post-test experiment collecting compost bags across three conditions (control, treatment #1, treatment #2) for 10 days pre-intervention and 10 days post-intervention. We utilized six bins (2 per condition) on two floors of the Nest. Our sample size was 264 bags. We conducted a visual inspection of i) the number of contaminated compost bags and ii) the number of contaminated items per bag.

ANOVA and Tukey's Post Hoc Tests of significance were conducted. The only significant difference found was between the post-test *Collective Efficacy* group and post-test *Salience* group. Overall, however, the BI solution-based interventions did not have a significant impact on the identified problem behaviour of contamination in the compost bins at UBC's Nest, and neither of our hypotheses were supported. However, this does not preclude the interventions being useful in a different context, or if implemented alongside other measures.

Part A. Problem Background

Between 2002 to 2018 Canada saw a 16% increase in the amount of solid waste generated, resulting in a total of 35.6 million tonnes of waste (Environment and Climate Change, 2022). There are several negative and concerning impacts of this huge and increasing amount of waste including:

- **Environmental:** Organic waste (e.g., food, paper, plants) in landfills converts into methane during decomposition, and is one of the largest contributors to greenhouse gas emissions (Khalid, Arshad, Anjum, Mahmood, & Dawson, 2011) which, in turn, has been shown to be a great contributor to the universal problem of global warming (Themelis & Ulloa, 2007). Despite increased composting rates, most waste produced by Canadians is still sent to landfills, which directly contributes to water, air and soil pollution (DiGiacomo, W.-L, Lenkie, Fraser, Zhao, & Kingstone, 2017).
- **Health and well-being:** Among the many pro-environmental behaviours, the level of waste separation is widely recognized as a key indicator for measuring a community's quality of life and urban sustainability. A 2018 report by the World Bank shows that in high-income countries, one-third of the waste is recycled and composted, whereas in low-income countries, the recycling rate is only 4% (Kaza, Yao, Bhada-Tata, & Van Woerden, 2018). As well, some research has linked methane exposure to premature mortality (Fang, Naik, Horowitz, & Mauzerall, 2013), although no definitive relationship has been confirmed.
- **Economic***:* Improperly sorted waste increases the costs of recycling programs by increasing the time and labour required to properly re-sort items at a centralized sorting facility or during pick up (Bohm, Folz, Kinnaman, & Podolsky, 2010). It is estimated that for every percentage decrease in contamination, recycling costs could be reduced by more than $600,000 (Chung, 2018). Organic waste also contributes to billions of dollars in economic losses globally. Composting could help reduce this economic loss with reduced pollution in landfills and the development of bio-gas and bio-fertilizer to recycle nutrients back into the soil (Linder, Lindahl and Borgstrom, 2018).

The volume and negative impacts of waste could be drastically reduced if items were to be properly sorted and a portion of this waste diverted to recycling and composting streams (Ayilara, Olanrewaju, Babalola, & Odeyemi, 2020). Cities across the globe are implementing targeted action plans to curb waste generation. For example, between 2008 and 2020, the City of Vancouver reduced waste going to the landfill by 30% and greenhouse gas emissions by 16% through their Greenest City Action Plan initiative. (City of Vancouver, 2021).

Similarly, reducing waste reduction at UBC is an integral component of its Climate Action Plan 2030 and a key strategy to uphold its commitment to climate justice and tackle the climate crisis. UBC's 2014 Zero Waste Action Plan and AMS's Sustainable Action Plan highlight specific goals to reduce overall waste and waste stream contamination across the campus, including by the AMS Nest (student union building).

Reducing waste and waste stream contamination is primarily behavioural in nature and, hence, a good fit for a BI approach. Assuming operational standards are in place (for example, are proper bins available and is waste collected regularly?), much of the problem stems from people's waste sorting behaviour. In other words, how might we encourage more people to separate their waste into the proper bins?

Even a small percentage increase in more accurate waste-sorting behaviour could have potentially large impacts to preserve the environment, improve health and save more money. Moreover, improving waste separation can be a "wedge" or catalytic behavior that promotes other environmentally related behaviors (Thøgersen & Crompton 2009). Several studies including (DiGiacomo, W.-L, Lenkie, Fraser, Zhao, & Kingstone, 2017; (Linder, Lindahl and Borgstrom, 2018) have identified a clear urgency to increase composting adherence through identifying best practices to reduce the adverse environmental impact of landfills. While several countries have introduced policies to increase the collection of organic waste for composting, there is still a need to further explore how behavioural insights can be used to increase composting and the recycling of food waste.

Part B. Behaviour & Context

Target Behaviour

Improving waste sorting behaviour in high-traffic receptacle bins in the Nest provides an opportunity to support UBC and its stakeholders to meet its sustainability goals. After reviewing the 2017 and 2018 Waste Audit Reports (Common Energy, 2017; Common Energy, 2018), we determined that a prominent sustainability issue occurring in the Nest was inaccurate waste sorting, specifically, with the compost bins. In consultation with our project partners (UBC SEEDS and AMS), we learned that a very high percentage of compost bags are re-routed to the landfill due to contamination, confirming that this is the main waste sorting challenge experienced in the Nest. Given this, our chosen target behaviour is to **decrease contamination in the compost bins** in the Nest.

Often plastics, garbage and other non-compostable items are placed in the compost bin, with plastic lids from compostable containers being the main problem. This results in contamination and the entire bag being re-routed from the composting facility to the landfill. Not only does this contribute to our already overflowing landfills and have a negative environmental impact, but it also increases the time (and therefore cost) of the custodial staff who must divert the compost to the waste stream.

Attempting to improve composting behaviour meets all the MISFIT criteria and, hence, a good candidate for a BI project. Namely, (M) there is a specific and observable quantitative behaviour to measure; (I) the behaviour impacts the larger climate crisis problem; (S) there is a sufficient sample size; (F) it is feasible given resources and timelines; (I) there is a clear and describable population; (T) we can reach the population of interest for a timely intervention.

Measurement

Table 1 highlights several options we considered when determining how to measure contamination in the compost bin and their feasibility.

Table 1. Waste Auditing Feasibility Analysis

Waste Auditing Options	**Feasibility**
Observation of users as they put items into bins	*Low.* Time consuming and resource intensive.
Visual audit	*High.* Requires few resources*, least amount of effort and time. Approach used by UBC Custodial Services.
Volume based (number of contaminants per litre of waste volume)	*Low.* Requires inspecting 80% or more of bin contents and counting individual contaminant items.
Weight based (number of contaminant items per kg of total contents of bin	*Low.* Requires inspecting 80% or more of bin contents and counting individual contaminant items. Scale required.
Full waste audit (all items in the waste must be grouped into categories and weighed).	*Low:* Most resource intensive.

*Resources are limited due to team members' residing outside of the Vancouver area.

In consultation with our UBC partners we conducted a visual audit, similar to how contamination is determined by UBC's custodial services (i.e., UBC doesn't necessarily care about *how much* contamination in in each compost bag, but rather that the bag is contaminated at all) and with the highest feasibility score, as determined in the table above.

Population of Interest

The population of interest for our study are individuals frequenting and disposing of waste in the Nest. This includes students (the majority of the population), faculty and visiting members of the community. Exact numbers of individuals visiting the Nest and disposing of their waste each day is unknown, however the Nest has several

food establishments on both the main and lower levels and is one of the busiest buildings on campus. Bags in the compost bins are filled and changed several times per day by UBC Custodial Services.

Key Barriers

Through intercept interviews held in the Nest and secondary research we have identified the following barriers to proper waste sorting behaviour:

- **People are unsure of how to properly sort their waste on the UBC Campus:** Jurisdictions across the globe have different waste sorting guidelines. The City of Vancouver, for example, has different guidelines than the UBC campus! This poses a significant barrier as UBC for local Vancouverites and the large international and out-of-city student population who are all unfamiliar with proper waste sorting guidelines specific to UBC. The intercept interviews indicated that most of the waste sorting confusion surrounded what items go into the compost and garbage bins (people seemed to better understand what goes into recycle and paper bins).

  "I feel like I'd like a better idea of what to do … I'm not very familiar with what British Columbia expects. I just assume they're following the rules here at UBC."

- **Signage above bins is confusing:** Signage above the Sort it Out stations in the Nest is non-existent. Inconsistency and lack of standardization among waste disposal signage is not uncommon (Wu, Lenkic, DiGiacomo, Cech, Zhao, & Kingstone, 2018), yet problematic in that it can lead to confusion and therefore a decrease in accuracy (Ben-Bassat & Shinar, 2006), as well as a decrease in comprehension and compliance (Shinar & Dewar, 2003).

  "Sometimes it's not clear what the item is made of, and labelling on the bin is not clear."
  "Sometimes it's unclear where to put something, so I just throw it in the garbage."

- **People are in a rush:** The Nest is a busy place as students and faculty often come in and out of the building to eat and quickly return to class. These competing priorities, compounded by the lack of knowledge and clear signage, are reported barriers to proper waste sorting in the Nest.

  "If I am rushed, I throw it all in the garbage."

- **Lack of motivation:** Students reported laziness and futility as barriers to proper waste sorting. Specifically, students see their peers improperly sorting waste and feel that, regardless of what they do, the waste ends up in the landfill.

  "My waste could be split into 4, but I am lazy and rushed."
  "I get confused sometimes. Nobody recycles properly. I live in residence and everyone throws garbage into compost, with plastic. It feels pointless."

- **System 1 thinking is engaged:** Many individuals using the sorting stations in the Nest have been frequenting this building for months, perhaps years. Likely the behaviour of disposing of waste has become an automatic process requiring little effort (Yang, 2020). Individuals may not utilize or even acknowledge the existing signage and displays to inform how they sort their waste, despite these resources being prominently displayed.

- **Several food establishments use non-compostable packaging**: Although UBC has mandated that food establishments in the Nest use compostable packaging, compliance is not 100%, and the "mandate" is not enforced.

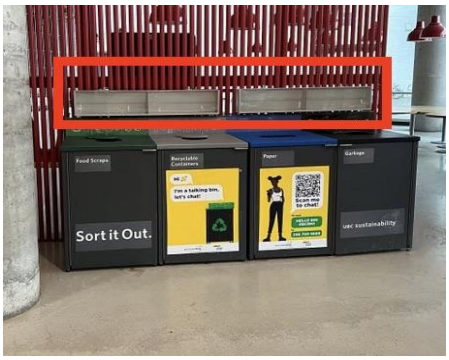
Touchpoints

We easily reached the population of interest, during intercept interviews and with our BI intervention, at the waste sorting stations in the Nest while people were disposing of their waste.

Part C. BI Solution

Current State of Receptacle Bins in the Nest

"Sort it Out" stations in the Nest collect waste in four main streams: compost, recyclables, paper and garbage. Above most Sort it Out stations are glass-enclosed display cases. The current "best practice" is to fill these with examples of products permitted in each bin. However, these display cases are not optimally utilized - some are half filled, some are completely empty, and some Sort it Out stations do not have any display cases at all above them. Overall, they are neglected, cluttered, disorganized and provide poor visuals to direct people to compost properly.



No items in glass display case

No display case

Incomplete items in display case

As well, some Sort it Out stations have "I am a Talking Bin, Let's Chat" labels on their front panel. The purpose of these Talking Bins is to help people get answers to their waste sorting questions by providing a QR code, text and phone number. However, only some bins have these labels and, of those that do, there has not been any evidence to indicate that they are effective in improving waste sorting behaviour.

Bins with no labels

Confusing and cluttered signage

Note: To ensure no external interference, we asked our client to remove all "Talking Bin" labels and clear display cases from the six compost bins that were part of the study. We were informed this was done as we requested, three weeks before the start of the study, but it was not (ten days before the start of the study, some cases still had product and two Sort-it-Out stations still had the "Talking Bin" labels). We can confirm that all display cases were clear ten days before the start of the study and all labels removed six days before the start of the study.

BI Solution

We tested two BI solutions to decrease rates of contamination in the compost bins, namely:

Solution #1: Optimize display cases + *SALIENCE* signage.
Solution #2: Optimize display cases + *COLLECTIVE EFFICACY* signage.

Optimize Display Cases

For both solutions, we optimized the display cases. In other words, we properly filled the display cases with products permitted in each of the four streams (compost, recyclables, paper and garbage). We carefully selected items, combining both problematic and commonly disposed of items, for each bin, as seen below:

Items selected for Compost Bin:

Left to right: Open clamshell container with checkered Paper inside, paper napkin with chopsticks in front, compostable bowl, compostable fork and knife

Items selected for Recyclable Bin:

Left to right: Plastic fork and knife, lid from the compostable bowl, coke can, water bottle, coffee cup with lid in front.

Items selected for Paper Bin:

= 

Left to right: Coffee cup sleeve, newspaper folded in half, magazine (partially behind newspaper)

Items selected for Garbage Bin:

Left to right: Chocolate bar, chip bar, granola bar, subway paper folded into a triangle

Final Filled Display Case (Example):

Solution #1: Optimize Display Cases + SALLIENCE sign

The first intervention optimized display cases (described above) and used a *Salience* Sign to increase composting behaviour. This sign focused on the most problematic composting error (plastic lids in the compost), as advised by the client and determined through observation. It was mounted above the compost bins in each of the two Sort it Out stations used in this intervention. Photos of actual sign and how it was attached is below:

Solution #2: Optimize Display Cases + COLLECTIVE EFFICACY sign

The second intervention optimized display cases (described above) and test a *Collective Efficacy* message to increase composting behaviour. It was mounted above the compost bins in each of the two Sort it Out stations used in this intervention. Photos of actual sign and how it was attached is below:

Applied BI Tools

The BI tools applied to our solutions include salience, simplification, cognitive load and message framing.

- **Display Cases:** By organizing, de-cluttering and selecting the most commonly disposed of items to display in the cases above the Sort it Out bins, we expect people to find it easier and less cognitively challenging to compost properly.
- **Signage:** Signs in both our BI Solutions avoid using large amounts of information and over-stimulating imagery. Instead, our signs were designed to grab people's attention through lots of white space, easy-to-action messaging and simple, relevant images. The "STOP" text and imagery in solution #1 and collective efficacy message in solution #2 are designed to engage System 2 thinking, encouraging deliberation, reasoning and self-control. Finally, we tested a novel messaging intervention, *Collective Efficacy*, in hopes of contributing to the research currently lacking in this area.

Justifying the Chosen BI Solutions:

Salience and Simplification: Salience bias describes our tendency to focus on items or information that are more noteworthy while ignoring those that do not grab our attention. As well, research shows us that a person is more likely to complete a desired behaviour if the messaging is easy to understand (simplification), especially for a high stimulus and rushed environment like the Nest.

- Recommendations from interview participants (N=16) included adding icons and images:

"Provide examples of commonly misidentified trash."

"I suggest adding in pictures and some descriptions."

"I suggest more illustrations, specifically of the more commonly disposed of items."

- Specific research on waste disposal signage found that using icons or pictures of items permitted in each bin improved the accuracy of sorting behaviour significantly, in comparison to signs which contained only words (Wu, Lenkic, DiGiacomo, Cech, Zhao, & Kingstone, 2018).
- Research has demonstrated that the use of images on signage tends to be more beneficial than words (Snodgrass & Vanderwart, 1980) and that simpler images result in quicker performance compared to more complex images (Isherwood, McDougall, & Curry, 2007). This may be because icons can communicate a large amount of information efficiently and are not limited by language (Isherwood, McDougall, & Curry, 2007).

Cognitive Load: Individuals have a limited amount of working memory, so when signage or instructions are too complex, involve too many steps, or are too distracting, people struggle with aligning their intentions to compost properly with their actual behaviour. Research shows:

- Research suggests that when there are too many icons (yes and no categories) and too much "visual clutter", individuals are unable to efficiently comprehend and retain information needed to perform the behaviour (Cole, Hammond, & Mccool, 1997; Rosenholtz, Li, & Nakano, 2007).

Message Framing: How messages are presented can influence individual behaviours, attitudes and action towards recycling. Message framing can also have a profound impact on aligning people's intentions to compost properly with their actual behaviour. Much of the research specific to waste sorting has focused on loss/gains. As well, several researchers called for more studies specific to message framing on waste sorting behaviour:

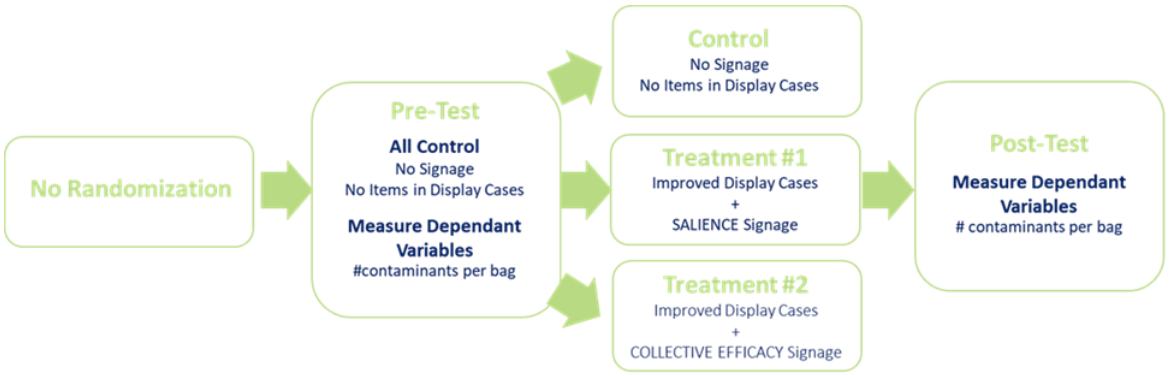
- One study showed that the loss/why message framing led to positive recycling behaviors immediately after the manipulation, but this effect did not persist over longer periods of time.
- Another study determined that it was important to first understand peoples' recycling habits and background before applying message framing to increase the likelihood of the desired impact and reduce any negative consequences.
- A study completed by (Wu, Guo, & li, 2021) indicates that future research should consider understanding the underlying background that relates to the message framing and how gain or loss framed messages trigger recycling behaviours in different groups.

Part D. Research Design

Research Design

To test which BI solution works best, we conducted a **quasi-experimental pre-test post test experiment** with three conditions. Quasi-experimental designs are like randomized control trials, without the randomization. This worked well for our study as we did not randomize which receptacle bins were assigned to each condition.

Figure 1. Research Design



Our conceptual hypotheses were as follows:
H_1: Treatment #1 (Optimize display cases + *SALIENCE* signage) will decrease rates of contamination in the compost bins, compared to the control group.
H_2: Treatment #2 (Optimize display cases + *COLLECTIVE EFFICACY* signage) will decrease rates of contamination in the compost bins, compared to the control group.

Research Design elements include:

Table 2. Research Design Elements

Independent Variable	The Independent Variable is *Improved Display Case + Signage.* We had three conditions: 1) Control (Display Cases not Filled and *NO* signage) 2) Treatment #1 (Improve Display Cases + *SALIENCE* signage) 3) Treatment #2 (Improve Display Cases + *COLLECTIVE EFFICACY* signage)
Dependent Variable	Number of contaminants per bag.
Sample Size	TOTAL = 264 bags • Pre-intervention = 150 bags • Post-Intervention = 114 bags LENGTH OF STUDY • The pre-test data collection ran for ten days (M-F) between March 13-24, 2023. • The post-test data collection ran for ten days (M-F) from March 27-April 11th (one day was excluded due to a federal holiday). • Weekends were avoided because 1) custodial staff is not the same as during the week and 2) there are fewer students using the Nest building.
Data Tracking	• Six busy compost stations were identified on the main and basement levels of the Nest, two bins per condition. • Different coloured bin liners were used for each of the three conditions.

	• Custodial staff collected bin liners, put them in a cart and placed them in one of three larger cloth bags in Room 0043 in the Life Building – one bag per condition. • Bags were visually inspected at the end of each day by two trained Research Assistants and then removed by custodial staff the following day.
Measurement	• Three Research Assistants were trained to follow the same guidelines as UBC custodial staff to visually inspect and determine whether or not a compost bag was contaminated. • Research Assistants collected two types of data via an excel spreadsheet: ○ Continuous Data: The number of non-compostable items in each compost bag (How many contaminants were in the bag (0, 1, 2, 3, 4, 5, 6)?) If the bag had 6+ contaminants, it was recorded as 6. ○ Binary Data: The number of contaminated bags (Was the bag contaminated? Y/N). NOTE: We found that almost all the bags in our data set were contaminated (ie. the bag had at least one non-compostable item). Therefore, this data was not useful in our analysis.

Assessment of Research Design

Any research design requires a rigorous assessment to determine both internal and external validity.

- Internal validity measures how well a study is conducted and how accurately results reflect the studied group.
- External validity determines how applicable research findings are to the real world.

Below highlights potential validity threats and mitigation strategies:

Internal Validity

Experimental Design

This quasi-experimental pre-test post-test experiment is the most robust research option for our study. As we are not randomizing our study we cannot, for certain, claim causality. However, this type of study offers a control group which strengthens any claim of causality.

Spillover Effects

A spillover effect is an unintended effect from the treatment on a subject who was in the control, or different, condition. In our research study, spillover effects might occur because 1) the conditions are located too close to each other and 2) current signage on the bins influence the subject's behaviour. To mitigate spillover effects, we:

- Carefully selected compost bins so that all three conditions are as far apart from each other as possible. Specifically, two bins for each condition were located close to each other and far apart from the bins for other conditions as per below:
  - Two bins in close proximity for treatment #1 were on the north side of the main level.
  - Two bins in close proximity for the control group were on the south side of the main level.
  - Two bins in close proximity for treatment #2 were on the basement level.

  See Appendix II for a mapping of the bin locations.
- Product in the display cases and signage in front of all six bins were removed prior to the launch of the study.

External Validity

The study will be conducted in a building that is frequented mostly by university students, and comparatively less by faculty and campus visitors. Students may have different value and habits than the population at large. As well, the environment in which they are making the decision is often rushed, which may not be the case in the real world. As such, we should be cautious on the external validity outside of the campus environment.

Part E. Research Results

As UBC's standard waste disposal practice is that if there is even a single contaminant in a compost bag the entire bag is rerouted to a landfill, the goal was to achieve 100% compliance of non-contamination (i.e., zero contaminants in the bags). Due to this, initially we were expecting that non-contamination would be a feasible goal and that we would run analyses based mostly on the binary data, but once all data was collected it was clear the proportion of non-contaminated bags were too miniscule to draw any true inferences about the effectiveness of our interventions. In total, there were only three non-contaminated bags: only in the COLL group at pre-test, one in the COLL group at post-test and one in the CON group at post-test. Therefore, the focus of our analyses was based on the mean number of contaminants in the bags.

Analysis: Mean Number of Contaminants by Treatment Group

Initial exploratory analyses of the data revealed that there was a decrease in the mean number of contaminants found in the compost bags in all three treatment groups between the pre-test and post-test (Figure 2 & Table 3). However, these differences were not statistically significant.

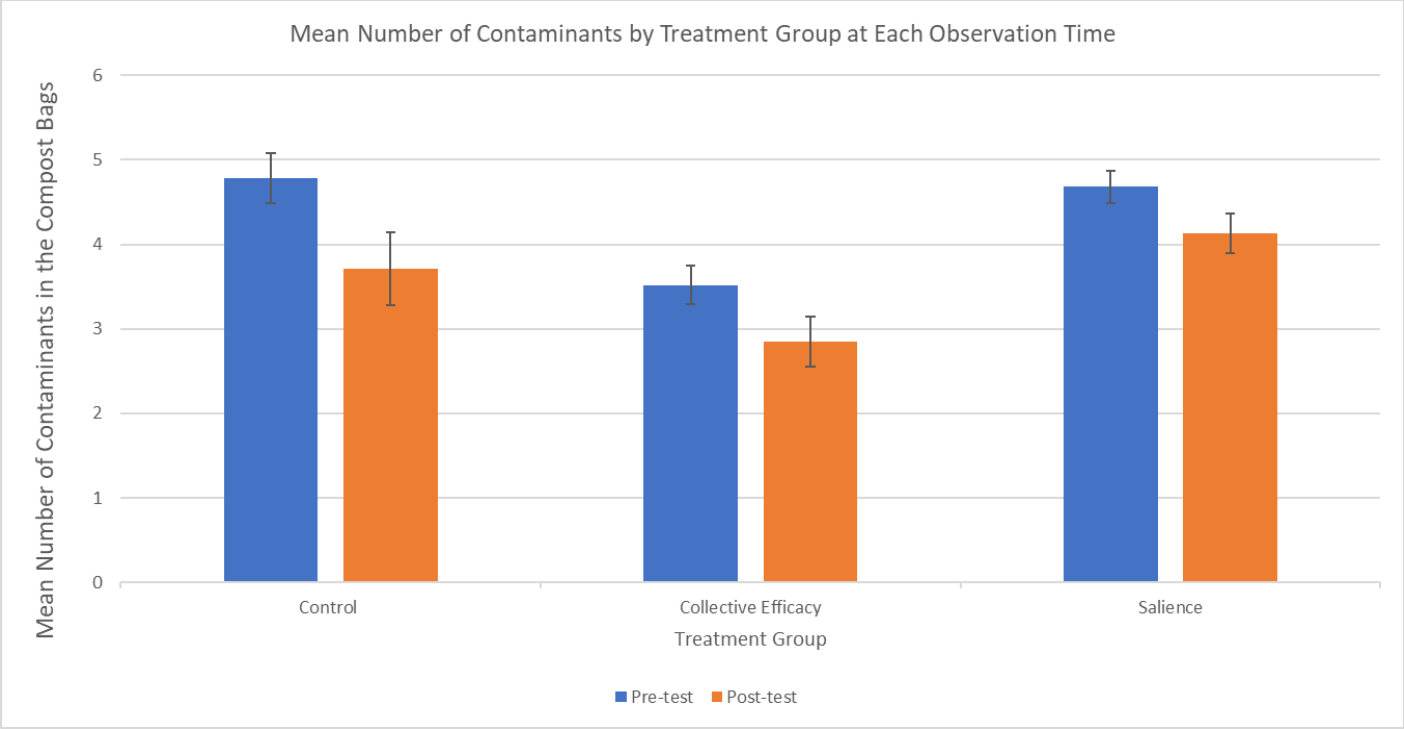


Figure 2. Mean Number of Contaminants by Treatment Group at Each Observation Time
Note: Depicted is the mean number of contaminants present in the compost bags recorded for each of the three treatment groups at pre-test and post-test. Error bars reflect +/- 1 standard error.

Table 3. Mean Number of Contaminants by Treatment Group at Each Observation Time

	Pre-test	**Post-Test**
Control	*M*=4.78, *SE*=0.30	*M* = 3.71, *SE* = 0.43
Collective Efficacy	*M*=3.52, *SE*=0.23	*M* = 2.85, *SE* = 0.30
Salience	*M*=4.68, *SE*=0.19	*M* = 4.13, *SE* = 0.23

Analysis: ANOVA Test of Significance

Due to the nature of out data (i.e., three treatment groups with one continuous dependent variable) an ANOVA test was conducted for significance. As depicted in Table 4, a two-way ANOVA yielded a significant main effect for of time on number of contaminants, $F(1, 2) = 10.80$, $p = .001$ ($MS = 3.53$, $SS = 31.53$), with a small effect size ($\eta^2p = 0.04$), as well as a significant main effect for the type of treatment group on the number of contaminants, $F(1, 2) = 12.58$, $p < .001$ ($MS = 39.68$, $SS = 79.35$), with a medium effect size ($\eta^2p = 0.10$). However, the interaction effect of time and treatment on number of contaminants was not significant, $F(1, 2) = 0.40$, $p = .67$ ($MS = 1.16$, $SS = 2.32$).

Table 4. Two-Way ANOVA examining main effects of time and treatment, and the interaction of the two, on number of contaminants.

	SS	*df*	*MS*	*F*	*p*	η^2p
Time (pre/post test)	31.53	1	3.53	10.81	0.001	0.04*
Treatment group	79.35	2	39.68	12.58	< .001	0.10**
Time x Treatment	2.32	2	1.16	0.40	0.67	0.00
Residuals	752.83	258	2.92			

Note: *η^2p = small effect, **η^2p = medium effect.

Analysis: Tukey's Test of Significance

The ANOVA test was followed by Tukey's post hoc tests to further examine pairwise comparisons. The intention of completing Tukey's Range Test as a post hoc to the ANOVA is that it functions to make all possible comparisons of means for every time and treatment combination. This test (as opposed to, for example, a paired sample t-test) is appropriate when sample sizes are not equal. Although Tukey's test is very thorough in that all combinations are reported on, they are not all necessarily meaningful.

Table 5 shows the most relevant comparisons specific to **pre-test post-test comparisons** of independent variables on dependent variables. Tukey's t-tests demonstrates that there was a change in number of contaminants in the COLL group at post-test as compared to the COLL group at pre-test ($M_{diff} = 0.67$, $SE = 0.37$), but it was not a significant change, $t(258) = 1.80$, $p = .47$. The same was observed for both the CON group at post-test compared to the CON group at pre-test ($M_{diff} = 1.06$, $SE = 0.50$), $t(258) = 2.14$, $p = .27$, and the *SALIENCE* group at post-test as compared to the *SALIENCE* group at pre-test ($M_{diff} = 0.54$, $SE = 0.31$) $t(258) = 1.78$, $p = .48$.

Table 5. Tukey's Post Hoc Test Examining Pre-Test Comparisons of Independent Variables on Dependent Variables

Comparison								
Time	Treatment		Time	Treatment	M_{diff}	*SE*	*df*	*t*	p_{tukey}
Pre-test	COLL	x	Post-test	COLL	0.67	0.37	258	1.80	.47
	CON	x	Post-test	CON	1.06	0.50	258	2.14	.27
	SALIENCE	x	Post-test	SALIENCE	0.54	0.31	258	1.78	.48

Note: COL = Collective efficacy group; CON = Control group; SALIENCE= Salience sign group.

Table 6 shows the most relevant **post-test comparisons** of independent variables on dependent variables. There was no significant difference in the number of contaminants between the post-test CON group when compared to either the post-test COLL group (M_{diff} = -0.87, *SE* = 0.48), *t*(258) = -1.82, *p* = .46, nor when compared to the post-test SALIENCE group (M_{diff} = -0.42, *SE* = 0.43), *t*(258) = -0.97, *p* = 0.93. However, there was a significant difference between number of contaminants in the post-test COLL group when compared to the post-test SALIENCE group (M_{diff} = -1.26, *SE* = 0.37), *t*(258) = -3.47, *p* = .01.

Table 6. Tukey's Post Hoc Test Examining Post-Test Comparisons of Independent Variables on Dependent Variables

Comparison									
Time	Treatment		Time	Treatment	M_{diff}	*SE*	*df*	*t*	p_{tukey}
Post-test	COLL	x	Post-test	CON	-0.87	0.48	258	-1.82	.46
		x	Post-test	SALIENCE	-1.26	0.37	258	-3.47	.01*
	CON	x	Post-test	SALIENCE	-0.42	0.43	258	-0.97	.93

Note: COL = Collective efficacy group; CON = Control group; SALIENCE= Salience sign group. *p < .01;

Summary

Analyses determined that the only statistically significant change found was between that of the post-test Collective Efficacy group and the post-test Salience group. That is, the mean number of contaminants found in the compost bags was significantly less in the Collective Efficacy group as compared to the Salience group.

There were no significant changes detected between either of our treatment groups in comparison to the control group, therefore there was no evidence to support that either of our interventions had any impact on waste sorting behaviour in the Nest. Neither of our hypotheses were supported.

However, null results do not mean that there is definitively no relationship, but rather that the relationship is inconclusive. Due to some limitations and challenges (detailed in Part H), we do believe that these interventions may be useful in a different context, or if implemented alongside other measures.

Part F. Recommendations

The study described investigated the impact of salient and collective efficacy messaging on composting behavior in the UBC Nest building. Overall, the findings indicate that these BI solutions did not have a significant impact on decreasing the number of contaminants in compost bins.

Despite this, we feel the BI solutions could have made an impact in a different context specifically, without interference from on-site construction and a larger sample size (see Part H, Reflections, for a deeper discussion of challenges and limitations). We recommend our UBC project partner consider duplicating this study at a future date with a longer study duration and more rigourous conditions.

Though we found null results for our tested interventions, through literary review, intercept interviews with patrons in the Nest, and our hands on experience with the problem behaviour in the Nest, we would make the following recommendations:

1. **Make compostable packaging mandatory for food establishments.**
   - ✓ Work closely with the food establishments to identify compostable packaging suppliers.
   - ✓ Prioritize the most problematic items such as plastic lids.
   - ✓ Set deadlines and hold food establishments accountable.

2. **Simplify all Sort-it-Out Stations.**
   - ✓ In this study, it is possible that removing labels and properly filling display cases resulted in people being more conscientious about their composting behaviour. This may have contributed to the overall reduction in contaminants given that we observed a decrease in contaminants in *all* groups including the control group.
   - ✓ Currently, display cases are either non-existent or improperly filled. As well, some stations have "Talking Bin" labels and some do not. We recommend improving all display cases as was done in this study and removing all labels on Sort-it-Out stations in the Nest. This will simplify and reduce cognitive load.
   - ✓ These are low-cost and low-effort actions with no downside and potentially high impact.

3. **Ensure the bins are uniform across campus.**
   - ✓ Initially, our team was confused on the bin colours. Often a blue bin is used to recycle containers. Yet, at the Nest, a grey bin is used for recycling containers and a blue bin is used to dispose of paper products. We expect the bin colours may be confusing. While it may not be possible to change these, an audit of bins across campus to ensure uniformity is recommended.

4. **Station people at Sort-it-Out Stations.**
   - ✓ Position people at waste sorting stations to help guide people to properly sort their items. We recognize this is a more expensive, and perhaps prohibitive, recommendation. However, composting behaviour requires 100% compliance in the Nest which is very difficult to achieve and may require this type of financial commitment.
   - ✓ We recommend designing and testing this type of intervention over the course of a school year. For example, station people at Sort-it-Out stations in the Nest for two weeks, four times per school year and measure the number of contaminants per bag (as this study did) to assess the impact of sustainable behaviour change.

Part G. Discussion of BI & Research Ethics

Our research project aimed to influence people's waste sorting behaviour and reduce contamination in the compost bins in the Nest building at UBC. Our planned interventions improved signage directly above or on the receptacle bins through BI solutions such as simplification, salience and message framing.

Throughout the project, we took seriously the ethical guidelines outlined in the TCPS 2: CORE-2022 training and the University of British Columbia's Behavioural Research Ethics Board Protocol. As such, we have evaluated the ethics of each project stage and developed appropriate mitigation strategies.

Ethical Evaluation: BI Solution

An evaluation of our planned project to influence people's waste sorting behaviour determined that all ethical considerations were met.

Table 7. Improving Waste Sorting: Ethical Evaluation Summary

"Nudge" for Good	Improving waste sorting behaviour has positive environmental, health and economic impacts as detailed in Part A of this report.
Freedom of Choice	Our BI solution to improve signage maintained freedom of choice. There were no costs or barriers for decision-makers to make a different choice.
Transparency	Our BI solution involved improved signage which, along with the research process, was fully visible and transparent. Decision-makers knew when they are being influenced.
Publicity Principle	We were willing to tell decision-makers (and others) that we were attempting to influence their waste sorting behaviour through our BI solution.
Vulnerable populations	Our BI solution did not unfairly influence or harm vulnerable or marginalized populations.
Benefit vs. Harm	Our experiment attempted to nudge the population of interest to adopt healthy composting habits and did not provide any harm. Our ethical assessment concluded alignment of interest between us, as researchers, and participants who are motivated to improve their composting behaviour.
Evidence base	As demonstrated in Part C, evidence exists that our BI solution could have the intended positive effects.
Scaling	Our BI solution is scalable across the UBC campus and other jurisdictions for improved environmental, health and economic outcomes.

Ethical Evaluation: Exploratory Research

We ensured a high ethical standard in our exploratory research methods through the following guidelines:

Intercept Interviews: Ethical Guidelines

- Approvals to conduct in-person intercept interviews were obtained through UBC's Behavioural Research Ethics Board (BREB).
- A participant consent form was developed following BREB ethics standards, including: 1) an overview of the project and the intended use of the data; 2) information on how the data will be stored; 3) assurances of confidentiality and anonymity; 4) contact information to address any questions and 5) requesting voluntary consent. No names or identifying information was collected. See Appendix I.
- Verbal consent was obtained, and audio recorded by interviewers.
- Interview questions were designed to eliminate biases. Questions were reviewed for inclusivity and impact by our UBC advisor and all team members.
- Training was provided for interviewers to minimize leading questions and maximize data collection from a diverse group of participants.

Academic Literature Review: Ethical Guidelines

- "Gold standard" peer reviewed research was selected to guide our BI solution.
- We mitigated confirmation bias by seeking out opposing research to best inform our study.

Ethical Evaluation: Research Design

Sign Design

- An audit occurred to ensure all symbols, text and design elements of the signs are inclusive.

Data Collection

- Participants could easily opt-out of the study by not disposing of their waste at the receptacle bins provided. As well, data privacy and anonymity were not a concern as we did not observe or record the composting behaviour of participants.

Data Evaluation and Communication

- Our data analysis plan was ethically rigourous to mitigate any biases in effectively analyzing and, subsequently, communicating findings through the final proposal and presentation.

Code of Conduct

The interests of our partners were aligned with our research interest, that is to improve waste sorting behaviour in the Nest. Yet, the success of our project is determined by our ability to build healthy and productive relationships with all our stakeholders. This includes members of the SEEDS program, AMS Sustainability, UBC Sustainability and Engineering, UBC Custodial Services and, of course, participants in our study. As such our Code of Conduct encompassed:

- Honest, inclusive and transparent communication.
- Handle conflict with respect, accountability, active listening and perspective taking.
- Respect the client work environment, processes and regulations.

Part H. Project Reflections

Overall, the team was successful in implementing two BI solutions and collaborating with our UBC project partners. The team is thankful to everyone involved with this project including our advisor, program faculty, and our UBC project partners. We are especially appreciative of the research assistants for their on-the-ground support during the project including conducting interviews, setting up the display cases and collecting data.

Successes

Team Collaboration: As our first BI project, team development, cooperation, engagement and learning over the past nine months has been a positive experience.

BI Solutions: Even though our BI interventions did not have a significant impact on the contamination within the compost bins in the Nest, we feel that these solutions have potential to make a significant difference with a longer study duration and more rigourous conditions, as detailed in the recommendations section, above.

Challenges

Lack of Access to Physical Location: As we did not have any project team members in the geographic area of the Nest, our project relied on teleconference communications with our project partners, delegation of duties to research assistants and, overall, was challenging to operationalize. Specifically:

- During the *Research Stage*, we relied on the research assistants to conduct intercept interviews. While we were pleased with their work, we also felt that if we had conducted the interviews ourselves, we may have probed deeper and ultimately gained more insights.
- The lack of presence of any team member also had an impact during the *Innovation Stage*. Specifically, we were not able to visually inspect the Nest, the food establishments, and the people in the Nest during normal daily operations. We relied on others to inform us of any potential threats (such as the construction) and opportunities, as well as data collection information (which ultimately was inaccurate i.e., we were advised that there would be substantially more compost bags produced than there actually was).
- During the *Data Collection* stage, we, again, relied on research assistants to set up the display cases, put up the signs and measure bag contamination. We feel if we were more involved in this stage, an additional element of research rigor may have been achieved.

Project Ambiguity: From the onset, the project was very loosely defined by the partners posing a challenge to the team. A more clearly defined problem from our UBC partners would have been helpful earlier on in the project. Further, partner contacts and the approval process were difficult to navigate. For example, our main contacts had very little involvement in the project. Instead, we spent considerable time identifying who at UBC could help us implement the project. Once we did this, we were very well supported and the project advanced smoothly. Finally, a funding budget would have been beneficial at the beginning of the project to address the geographical limitations of our project team and allow for better rapport to be built with our partners and research assistants.

Limitations

Project Suitability: We were initially advised that a small number of contaminants per bag was acceptable for bags to continue on to be composted. However, we later learned that 100% compliance is necessary to avoid diversion of the entire bag to the landfill. Had we known this earlier, we may have opted to focus our BI project on another waste sorting behaviour as 100% compliance is virtually impossible to achieve.

Data Collection: We encountered several data collection limitations during our project. Specifically:

- Our project was initially designed over a two-week period with an anticipated sample size of 480 bags. This figure was based on information provided to us by our project partners and, unfortunately, was over-inflated, resulting in an impromptu extension of our study to four weeks. Even with this mitigation strategy, we only collected 264 bags. While we adjusted our project, we do feel there was an overall negative impact on the project.
- Similarity, we were unaware of construction in the Nest which impacted the number of bags collected from nearby stations. Had we known this in advance we would have designed the study differently.

Population of Interest: Our project was limited to a specific population of interest (students, faculty and visiting members of the community that attended the Nest) which impacted the external validity of the results.

Lessons Learned

There were several lessons learned during the project including:

- Without a physical presence, it is critical to anticipate any threats and obtain verification that such threats are mitigated. For example, rather than rely on our partners estimation on the number of compost bags removed daily from the Nest, we could have done a pre-trial to achieve a more accurate number.
- While we were ultimately well-supported by our UBC project partners, it took the team quite a while to identify the appropriate contacts that would allow us to implement our intervention. We learned that spending the time to get clarity on roles and responsibilities earlier on in the project is time well spent.
- As part of the hybrid project environment and improving collaboration and communications, we would recommend that BI projects include a budget to facilitate on-site meetings between the project team members, partners and stakeholders.
- It would be beneficial to have a post project dialogue with all stakeholders to get a better understanding of everyone's perspective, desired outcomes and lessons learned. In a sense it would create an opportunity for discussions that focus on continuous improvement and transparency.

Overall, we felt the project was a success and learned a great deal about the BI process, team development and client management. The team enjoyed working together and with our colleagues at UBC to test two behaviourally informed interventions.

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Appendices

Appendix I. Research Methodology

Secondary Research: Academic Literature Review

- We conducted an academic literature review using search engines including Google Scholar.
- We focused on identifying and reviewing "gold-standard" peer-reviewed research that is current and relevant to waste sorting at the public and institutional level.
- We investigated BI solutions related to improving waste sorting more broadly and, given the lack of quality signage above the receptacle bins in the Nest, we went deeper into BI solutions specific to improving signage.
- We met with Professor Jiaying Zhao who shared her own research findings on improving waste sorting.

Primary Research: Intercept Interviews

Methodology

- Intercept interviews were conducted in the Nest building from January 8-12, 2023.
- Intercept interviews augmented the secondary research by providing timely, on-site, and very useful insights from participants actively engaged in the waste sorting process.
- Given that all team members do not live in Vancouver, three research assistants were recruited and trained to conduct the interviews.
- Interviews were recorded, transcribed, and analyzed into main themes.
- An interview protocol, consent documents, and training guidelines were developed under the advisement of our project sponsor and can be found below.

Training Guide

Dear Research Assistants,
Thank you very much for your time in assisting us with our capstone project!

Capstone Project Background: Garbage rotting in landfills increases the risk of soil, water and air pollution, and creates the greenhouse gas methane which is twenty times worse than carbon dioxide (C02). Compostable food waste ending up in the landfill is often caused by contamination, created when certain materials (such as recyclables or items that should go into the landfill) are mixed into the compost bin and cannot be removed. This undermines composting efforts because an otherwise reusable resource must be sent to the landfill.

Research Goal: Make waste sorting easier in order to help reduce compost bin contamination. (Decreasing the wrong items like garbage or recycling going into the compost bins)

Intercept Interviews Guideline:
- First and basement floors waste bin area of Nest at UBC (record location - 20 interviews up and 20 down)
- Greet people before depositing waste in the bins
- Greet people with some food waste to dispose of (Not people with just recycling)
- Introduction and five (5) questions taking a couple minutes of their time
- 40 Questionnaire sheets provided (mark these as L1, P1, K1, etc.)
- Audio recorded interviews (Sony 4GB SD voice audio recorders provided with user guide and batteries by Steve Wilson)

Please test the voice audio recorder prior to starting the interviews to ensure it is working properly.
- If not willing to provide consent, thank them for time and move to next person.

- We will endeavor to have one of the Capstone Team members onsite during interviews.
- For each person, please use a separate intercept interview questionnaire sheet and number it.
- You do not have to write anything on the sheet unless there is something specific that you want to add under the **notes:** area at the bottom. The voice audio recorder will record the interview and persons responses to the questions being asked.
-At the end you can ask them if they would like to take a consent form with them (most will likely say no)…

If you require any additional information, please contact the Capstone Team members at:

Steve Wilson: **Cell:** 604-729-3341 **Email:** swilson@bcit.ca
Sylvia Apostolidis: **Cell:** 416-262-2779 **Email:** sylvia@thejasmargroup.com
Cassi Chesher: **Email:** cassi.holmes@icloud.com
Joanna Garcia: **Email:** joannagarcia11@outlook.com
Kate: **Cell:** 778-875-8914 (can text Kate too)

Thank you very much! Capstone Team: Sylvia, Cassi, Joanna and Steve

Intercept Interview Protocol

Intercept Interview Questionnaire #_____

Date / Time: _____

Location: _____

Interviewer: _____

Background Statement: - Hi, my name is _____. I am assisting with a research project to make waste sorting easier for people in order to help reduce waste bin contamination (in particular, we are interested in reducing the tendency to put the wrong things in the compost). I just want to ask you a couple questions about your waste sorting experience today. It will only be about 3-4 minutes of your time. Would you be up for that?

I will not be asking for any personal information from you but in order to ensure that I collect your question answers accurately, I would like to audio record your responses. Is that ok?

Your answers will be confidential and you may withdraw from the interview at any time.

Thank you!

Verbal Consent (audio recorded) - Can you please confirm that you have agreed to provide consent for me to audio record your responses to the following five (5) questions. Thank you!

Questions:

1. Could you please dispose of your waste and talk through your thought process as you do this?
2. How would you rate your waste sorting experience (on a scale of 1 to 5)
   (1-very bad, 2-bad, 3-neutral, 4–good, 5-very good)
3. Can you tell me about anything negative or confusing about your waste sorting experience today?
4. Can you tell me about anything positive or pleasant about your waste sorting experience today?
5. What could make the waste sorting experience better?

Thank you very much for your time today.

Notes:

Consent Form

Behavioural Insights Certificate Course Project
Study Overview and Consent

Welcome! We are conducting this study as part of a Behavioural Insights course project about encouraging better composting behaviours on campus at UBC Sauder.

For this study, you will participate in a short interview. The interview should take about 3-4 minutes. You will answer questions about your experience sorting waste today. Your answers will be confidential, and no identifying information will be collected. You may withdraw from the interview at any time.

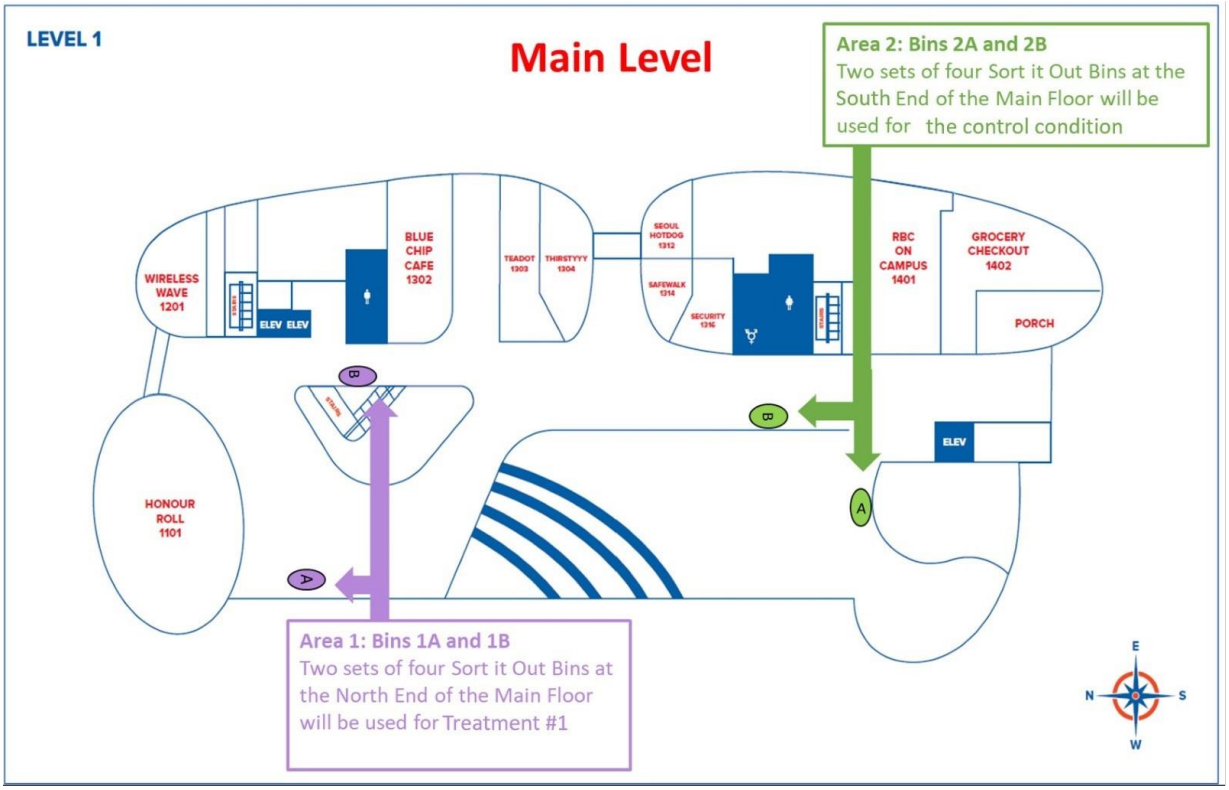
Data will be stored on an encrypted, password-protected computer for a period of at least six months.

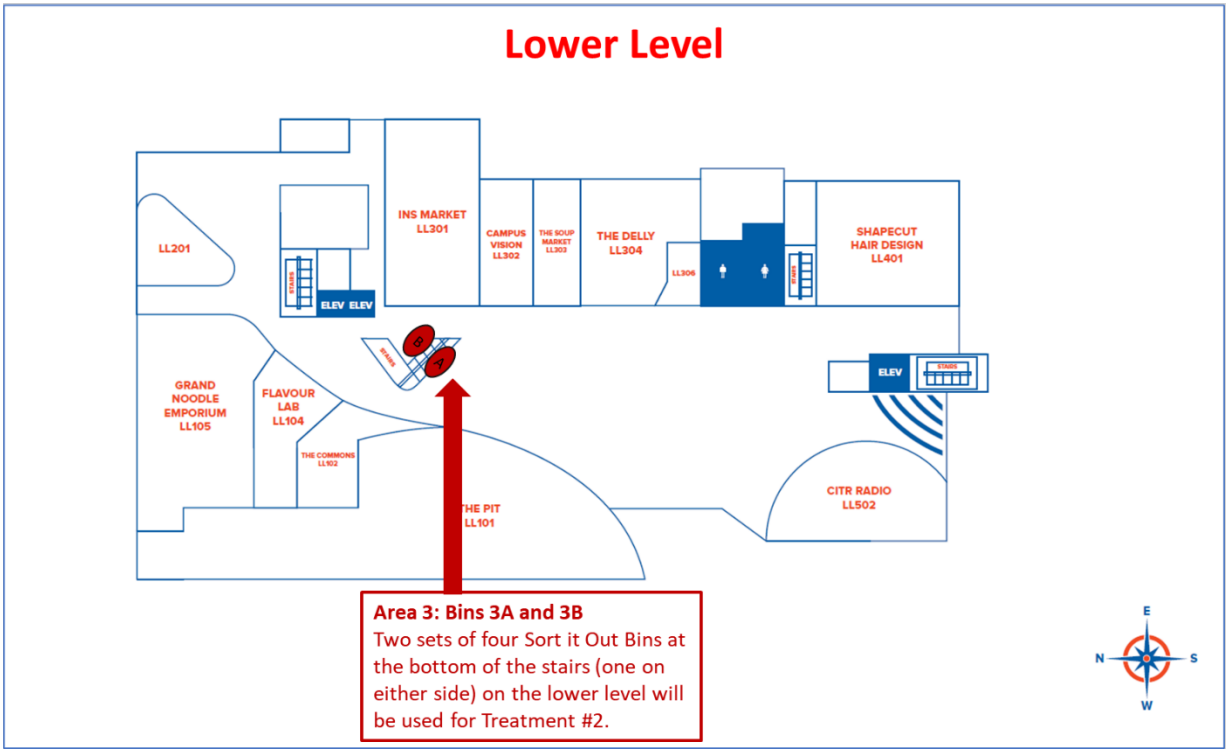
If you have any questions or complaints, you may contact any of the following:
Student Project Leader: Sylvia Apostolidis, sylvia@thejasmargroup.com
Advising Professor: Katherine White, Katherine.White@sauder.ubc.ca
Principal Investigator (PI): David J. Hardisty, david.hardisty@sauder.ubc.ca

If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at 604-822-8598 or if long distance e-mail RSIL@ors.ubc.ca or call toll free 1-877-822-8598.

By taking part in the interview, you are giving your consent to participate in this study.

Appendix II. Bin Locations





Appendix III. Team Charter

Team Bonding:

- At the start of each meeting, we'll check in with each other with questions such as: "How's your day? What's going on? What would you like to share? How's your schedule looking? Do you need any help?"
- We will reward individual and team successes and celebrate milestones with virtual toasts (which may likely include a glass of wine)!

Team Communication:

- We will communicate by email primarily and Discord. Files will be saved on OneDrive.
- Copy team members on partner, advisory and team email correspondence.
- Regular team meetings will be held weekly each Thursday via Zoom (Sylvia's account).
- Decisions will be made by compromise and, if this does not work, by majority.
- Any disagreements will be handled respectfully and professionally. We will practice active listening, asking questions, perspective taking and reflection.

Team Meeting Protocol:

To ensure efficient and productive team meetings and a fair distribution of work we will:

- Identify and rotate a meeting lead for each week.
- Create a meeting agenda in Word. The meeting lead populates the agenda with upcoming due dates, deliverables, items for discussion, etc. at least two days prior to the meeting and invites other team members to add to it.
- Team members read and come prepared to meetings.
- Meeting notes are summarized with accountabilities and deliverable dates on the meeting agenda and included in the next week's meeting agenda for follow-up.

Responsibilities:

Table 8. Team Responsibilities

Responsibility	Lead
Send calendar invites and host meetings	Sylvia
Track objectives and deadlines	Joanna/Sylvia
Create meeting agenda, take and distribute notes	Rotate each meeting
Attend meetings prepared; meet deliverables	All

Likely Obstacles & Strategies:

Some obstacles we might encounter include:

- Scheduling meeting times
- Communication breakdown
- Unequal contributions

Strategies to decrease the likelihood and/or impact of obstacles include:

- If we miss our weekly meeting or require more time, we'll meet on the weekend, preferably Sunday but there's flexibility.
- Make sure we attend all meetings and, if we can't, let team members know in advance.
- Check emails and respond asap and definitely within a day.
- Keep ourselves accountable for respectful behaviour.
- Speak up and say something in a respectful, open and non-judgmental way.

We will hold each other accountable to our joint commitments by:

- Discussing issues as a team. Speak up. "This is how I'm feeling".

Other rules to help us function smoothly as a team and meet each other's expectations include:

- Do our best.
- Communicate often and more often.
- Keep each other accountable.
- Support each other.

Skill Development:

Key skills each of us brings to the team include:

- Joanna: Organized, keep on task, background in research; knowledge of stats.
- Cassi: Can read people well, time management, can stay focused on research, quality control
- Steve: Research, interviewing.
- Sylvia: Survey design, research and analysis; good background in BI, speaker, organized.

Key skills each of us hopes to develop over the course of the project include:

- Joanna: Build partner and team relationships; collaboration.
- Cassi: All of it – RIDE model, statistics, research, interacting with stakeholders (how to gain access); how to put presentations together.
- Steve: Research, collaboration.
- Sylvia: RIDE model process; stats; deeper knowledge of BI.

Appendix IV. Statement of Work

Project Commitments

Below is a summary of the key points in our Research Project Charter submitted to our project clients and the SEEDS Sustainability Program Representative.

Research Purpose and Project Description

- The purpose of the research is to Improve waste sorting in the Nest receptacles. Specifically, we aim to reduce contamination in compost bins.
- We will conduct a randomized control experiment at busy Sort-it-Out stations on the basement and main floors in the Nest building to test a feasible and scalable BI solution across the campus.
- The project includes: 1) scoping the project, including an environmental scan and current waste audit practices; 2) conducting exploratory (primary and secondary) research; 3) identifying and developing appropriate research methods; 4) collecting and analyzing data; 5) writing a report including an executive summary, key findings and recommendations; 5) presenting findings and recommendations to the UBC project team.

Roles and Responsibilities

Table 9. Roles and Responsibilities

SEEDS PROGRAM REPRESENTATIVE	PROJECT CLIENTS *	BI PROJECT TEAM
• Support coordination of communication and meetings. • Support development of Charter and monitor progress. • Provide feedback as needed. • Introduce team members to cross-campus stakeholders as required. • Attend final presentation. • Follow up with client to determine implementation of recommendations and further action. • Publish final research project.	• Attend meetings and final research presentation. • Establish an ongoing communication process and schedule. • Identify informational/budget resources. • Discuss expectations, milestones. • Provide feedback on project proposals, progress reports and other supporting documents. • Support operational logistics and data collection, as feasible. • Eliminate any competing activities that may impact the research project.	• Work collaboratively with SEEDS program manager, project clients, Research Assistants and faculty members to ensure project success. • Meet all research project requirements. • Propose and commit to a communication schedule including copying SEEDS and project team on emails. • Submit project proposal, progress reports and draft report prior to final submission for feedback. • Submit final report including executive summary and present findings to project team.

*Project Clients include AMS Sustainability, UBC Sustainability and Engineering, UBC Custodial Services.

Approvals

- The approval process involves communication via email and online meetings.
- To date, the project client has approved the project and provided both human and budgetary resources to support solution design, research design and data collection.

Project Plan:

Our team uses Excel to manage project deliverables and responsibilities. A screenshot of our project plan, to date, is below:

		Who?	Done?
RESEARCH: EXPLORE PHASE	**NOV 14 - DEC 18**		
Status Update #4	18-Dec	Joanna, Sylvia	Complete
Review JZ materials, finish all exploratory research		Joanna, Sylvia	Complete
Intercept Interviews			
Prepare interview protocol	December	Steve, Cassi	Complete
Prepare consent documents	December	Steve, Cassi	Complete
Review ethics documents Kate sent. Determine if we need signed consent.	December	Steve, Cassi	Complete
INNOVATION: BI Solution & Research Design	**JAN 9 - FEB 12**		
Train RA's	5-Jan	Steve, Sylvia	Complete
Interviews conducted	Jan 9-13		Complete
Partner Meetings	12-Jan	All	Complete
Complete Research Charter that Laure sent	16-Jan	Steve	Complete
Interview Analysis	19-Jan	Joanna/Sylvia	
Status Update #5: Solution and Research Design Assignment	22-Jan	Sylvia/Cassi/Joanna	
Proposal Report	6-Feb		
Part A: Problem Background - Draft due	30-Jan	Joanna, Sylvia	Complete
Part B: Behaviour and Context - Draft due	30-Jan	Joanna, Sylvia	Complete
Part C: Explore - Draft due	30-Jan	Joanna, Sylvia	Complete
Part D: BI Solution - Draft due	30-Jan	Steve, Cassi	Complete
Part E: Research Design - Draft due	30-Jan	Steve, Cassi	Complete
Part F: Ethics - Draft due	30-Jan	Steve, Cassi	Complete
Exeuctive Summary - Draft due	2-Feb	TBD	Complete
Appendix: Statement of Work	2-Feb	Sylvia	Complete
Update Team Charter	26-Jan	All	Complete
In Class Presentation (Joanna to lead on Feb 8)	6-Feb		
Presentation draft due	1-Feb	TBD	
Assignment: Peer Feedback	12-Feb	Individual	
INNOVATION (cont): Preparation for Experimental Launch	**FEB 13-MARCH 5**		
Current signage and "I'm a talking bin" labels removed	20-Feb	Connor - Custodial Services	
Reading week at UBC	**Feb 20-24**		
Custodial Staff to conduct training for team and RAs re: waste audit process	27-Feb		
Project Update #6	6-Mar		
DATA COLLECTION: Experiment Launch & Field	**MARCH 6 - APRIL 31**		
Design of new signage completed	10-Jan		
Intervention Pre-Test	March 13-17	Custodial Services/RA's	
Intervention Post-Test	March 20-24	Custodial Services/RA's	
Data Analysis begins	27-Mar		
Project Update #7	9-Apr		
EVALUATION: Data Analysis & Communication	**MAY 1-MAY 31**		
Final Report Due + Presentations	29-May	All	