

Waste Bin Labels Intervention Project

ENV461/ENV1103H

THE U OF T CAMPUS AS A LIVING LAB OF SUSTAINABILITY



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Executive Summary

Unsorted waste has a litany of detrimental effects on the environment. It takes up valuable space in landfills, requires extraction of virgin materials, and contributes to climate change through the anaerobic respiration of organic waste, and waste hauling to landfills or other facilities. The University of Toronto has a diversion rate of 66% (in 2017) and while this is relatively high, there is room for improvement by standardising the structure and signage of multi-stream waste bins on campus, since a plethora of different signs and formats can currently be found.

New labels were designed by students working with U of T's Sustainability Office and the purpose of this project was to determine their efficacy in improving waste sorting behaviour, in comparison to the currently used ("current") labels. The comparative study was done through observations and surveys of people using the bins to throw items out. The study focused on assessing the effectiveness by 1) assessing whether the new bin labels, designed for improved waste sorting accuracy, improve individual waste sorting behaviour on campus and 2) elucidating what aspects about waste bins contribute to incorrect waste sorting behaviour on campus.

Main findings saw that 1) the new labels had no significant effect on waste sorting behaviour at the individual level. The rate of correct waste sorting behavior with the current labels and the new labels was 38% and 36% respectively; 2) At a stream level, correct sorting for all the streams decreased or stayed the same. Specifically, moving the container stream to hole 1 increased the amount of items going into the stream and the rate of contamination; 3) At an item level, half of all sorting improved. In particular, items categorised as "food containers and cutlery" saw a 48% increase in correct sorting with new labels; 4) A combination of changing the labels, the bin hole sizes and the bin hole order could have all affected sorting behaviour.

While this study serves as a good base level from which to further study waste sorting behaviour before and after an intervention, it is worth noting that it has several limitations. Most importantly, the study was conducted only two weeks after the new labels were installed, which meant that it may not have given people enough time to "get used to" them, creating a potentially unfair comparison between the pre- and post-treatment data. Additionally, visual limitations, such as not being able to tell whether coffee cups were full or empty, may have affected data collection accuracy.

Also, a series of recommendations for future research and the Sustainability Office are offered based on the findings and limitations. The recommendations for the Sustainability Office are listed: 1) Pre-test the labels before post-intervention to ensure they convey a clear and effective message about waste streams to target audience; 2) Incorporate colour into any new labels; 3) Change the focus from "do better labels work?" into "what sends the least amount of waste to

landfills”; and 4) Consult with the Procurement Office for better standardisation of certain items on campus.

Overall, this study has assessed how the new bin labels affect waste sorting behaviour on campus. By looking into the efficacy of the labels, the Sustainability Office can have more improvements in future waste sorting interventions, thereby increasing correct waste sorting behaviour on campus.

1.0 Introduction

Canada’s per-capita municipal solid waste (MSW) has been steadily increasing since 1990 due to urbanization, increased resource consumption, increasing household revenue, and lifestyle changes that have taken place over time (Conference Board of Canada, 2013). In recent years, per capita MSW generation in Canada was higher than most of the industrialized nations (Wang et al., 2015), at 2.66 kg/capita/day in 2000, compared to 2.11kg/capita/day in US in the same year (USEPA, 2009). Furthermore, an estimated 88% of water bottles – an item one would think was easy to recycle – are not recycled in Canada and only 25% of waste paper and paperboard is recycled (Busch Systems, 2017). In a more local context, Torontonians recycle an average of 27% of their waste in multi-residential properties, and 65% in single-family homes (City of Toronto, 2016). At U of T, the waste diversion rate is approximately 66% (SDK Environmental Consulting & Services, 2017). While this exceeds the Ministry of Environment’s goal of a 60% diversion rate, it is less than the City of Toronto’s desired goal of a 70% diversion rate by 2026 (City of Toronto, 2016).

The reason that this is problematic is because of how non-diverted waste is disposed. Landfilling is the most used process in many countries as the final link of solid wastes disposal (Salem et al., 2007) and landfills are rapidly reaching their capacity in Canada (Environment Canada, 2003). It is difficult to replace or expand landfills due to the public anxiety over social and environmental impacts and continual expansion of the city. Landfills also produce 25% of Canada’s methane emissions (Statistics Canada, 2007), contributing to atmospheric greenhouse gases concentration. Moreover, leachate from landfills, if is not carefully controlled before returning to the environment, may cause harmful effects on the groundwater and surface water (Salem et al., 2007), which will lead to further potential health risks to both ecosystems and human. Finally, it is also important to note that sending recyclable items to the landfill increases demand for virgin materials through oil drilling or mining. As such, it is imperative that we aim to reduce the quantity of waste we send to landfills.

While U of T does have a relatively high waste diversion rate, there is room for improvement in standardising the structure and signage of multi-stream waste bins (bins for garbage, containers, papers, and coffee cups) all around campus in order to further increase diversion rates. Previous studies at the university have found 11 different kinds of waste bins in Sidney Smith (SS), a central building for the Faculty of Arts & Science. The bins vary in color, shape of bin openings,

structure, and signage, which may be leading to confusion over what-goes-where when sorting waste. Around 55% of waste thrown into the garbage stream can be recycled or composted on campus (Aqqad et al., 2016), meaning more work could be done to specifically improve waste sorting behaviour on campus.

While there are a plethora of supply-side methods for reducing the quantity of waste sent to landfills, such as using less packaging or procurement policies for recyclability, well-designed waste bin signage can also be an effective method of ameliorating the problem (Zelenika, 2017). This is because knowledge of what goes into which bin is a crucial component of waste sorting not only because it affects contamination of bins, but also people's self-efficacy and confidence which can further affect willingness to engage in the behaviour (Zelenika, 2017; Milford, Øvrum, and Helgesen, 2015). Signs on multi-stream bins have been seen to improve sorting in multi-stream bins, based on a study by researchers at the University of Michigan (Binder, Glasser and Fuqua, 2017). **However**, one study that compared different, isolated interventions found that signage alone may have no effect on waste sorting accuracy (Andrews et al., 2013).

Other interventions have also been used to improve waste sorting, including bin placement (Ludwig, Gray and Lowell, 1998; DiGiacomo et al., 2017), removing accessibility of waste bins (this has proved to be ineffective because recycling contamination becomes too high), creating one stream recycling (Andrews et al., 2013), campaigns with posters and other signage, different colour schemes, sorting games (Zelenika, 2017) and monetary interventions (Skumatz and Freeman, 2011). Some of these, such as monetary incentives, are not practical for the scope of recycling on campus. Generally, it has been found that multiple initiatives together have a better effect than isolated interventions (whole is more than sum of parts situation) (Andrews et al., 2013).

This particular project focused on observing results of an intervention that involved new waste sorting labels, which were designed by students at UofT's Sustainability Office. The purpose of the study was to inform the Sustainability Office on whether the new labels are more effective in creating better waste-sorting behaviour than the current labels. Specifically, the following research questions are addressed in this study:

1. *Will the new bin labels, designed for improved waste sorting accuracy, improve individual waste sorting behaviour on campus?*
2. *What aspects about waste bins contribute to incorrect waste sorting behaviour on campus?*

It is anticipated that the results of this experiment help inform the office of the efficacy of the labels, offer suggestions for improving diversion rates through feasible means, and hopefully contribute to research on waste management interventions.

2.0 Methodology

The project involved conducting a pre- and post-intervention study by comparing the waste sorting behaviour between the current bin labels (pre-intervention), and new bin labels (post-intervention). The current bin labels, depicted below in *Figure 1*, are the bin labels currently being used across St. George campus.

Figure 1. Current Bin Labels



Hole 1



Hole 2



Hole 3



Hole 4

The new bin labels, depicted below in *Figure 2*, were designed for improved waste sorting accuracy by students at the U of T Sustainability Office. As shown, the colours, icons and label order changed. It is important to note that changing the label order also changes the corresponding bin hole size for that waste stream.

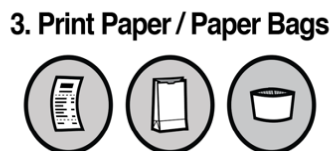
Figure 2. New Bin Labels



Hole 1



Hole 2



Hole 3



Hole 4

Data was collected through observations and surveys for both the pre- and post-intervention studies. The data collected from the pre-intervention (current bin labels) was used as a baseline to compare whether the post-intervention (new bin labels) improved waste sorting accuracy or reduced the aspects that contribute to incorrect waste sorting behaviour. The data collection lasted four weeks total: two weeks for the current labels and two weeks for the new labels. The variables we changed in the post-intervention included the waste bin labels, the order of the waste bin labels, and subsequently the bin hole sizes. The entire study took place at the two selected waste bins pictured below, which are located in the Sidney Smith cafeteria, a high traffic area on campus.

Figure 3. Waste bins selected for data collection



2.1 Observations

The observational part of this project consisted of observing individuals sorting their waste at the two designated waste bins in Sidney Smith. We concluded 108 observations for the current bin labels and 117 observations for the new bin labels, and recorded data on: the items individuals threw away; how the individual sorted their item(s); how long an individual took to throw away their item(s); and correctness of their waste sorting. We grouped the items individuals threw away into 11 categories: aluminum can, chopsticks, coffee cup, food, food container & cutlery, glass bottle, multi-material food wrapper, paper, paper food wrapper, plastic bag, and plastic bottle. Correct and incorrect sorting of each item category was based upon how the items should be sorted as depicted on the current bin labels. If an item wasn't depicted on the labels, we consulted the recycling services at U of T to determine the correct sorting of that item. It is important to note that organics waste sorting was outside the scope of this project, therefore food that was thrown out in either garbage or organics stream was deemed correctly sorted. See *Table 1* in the appendix for a detailed list of the items that belong into each category and how we deemed correct sorting for each category. **In addition to the evaluation of correct or incorrect sorting at the item level, we looked at overall sorting behaviour at the individual level.** To dictate what is correct and incorrect

individual sorting, we considered correct sorting only if an individual sorted all their items out correctly (i.e. a combination of correct and incorrect sorting is classified as incorrect). For example, if an individual **incorrectly** threw out a food container in the garbage hole and **correctly threw out** cutlery in the container hole, this observation would be counted as incorrect as the labels state food containers and cutlery go into the ‘container hole’.

2.2 Surveys

The surveys were conducted on a subset of randomly selected individuals from our observation sample size: 30 from the current bin labels and 29 from the new bin labels. The survey method used involved asking individuals (that we observed sorting waste) to fill out an online survey about waste sorting on campus; the true purpose of the study, which was to uncover whether the new bin labels improve waste sorting accuracy, was not revealed to participants. The survey contained nine to ten questions that aimed to elucidate answers regarding how easy or difficult it is to sort waste, whether the waste bins are easy or difficult to use, if they noticed a bin label change, whether the bin labels are helpful or unhelpful, and what aspects of the waste bins make waste sorting confusing or difficult. Such answers were useful in gaining a deeper understanding into the aspects that contribute to incorrect waste sorting on campus – aspects that are otherwise difficult to uncover through observational study alone. See *Table 2* in the appendix for a sample of the pre- and post-intervention surveys.

2.3 Study Controls

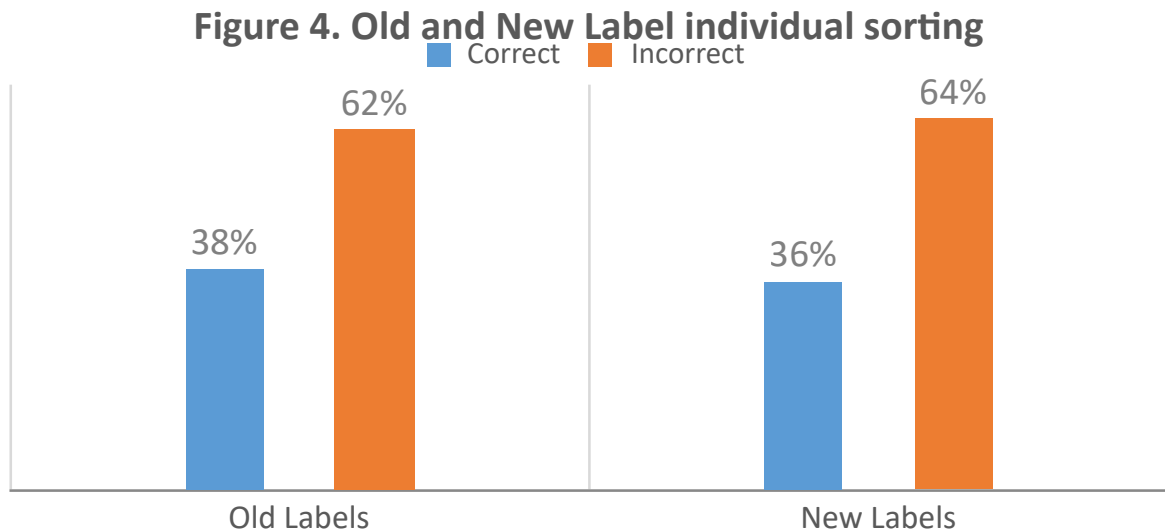
We implemented a number of controls in our study to ensure consistency, comparability and robustness in our data. In terms of data collection, all the observations and surveys were conducted between 12:30pm to 1:30pm at the same two waste bins in Sidney Smith cafe during weekdays. There was always two or three group members present when collecting data to cross-check work and eliminate errors. As for study participants, we included any individual who used the waste bins, such as students, visitors and faculty. We chose not to exclude participants from our study in order to obtain the largest sample size possible. Information about the experiment was not revealed to any participants in the study, and we chose not to include individuals who may know of our experiment, or who have already been observed or surveyed in our experiment, as knowledge of our experiment can influence behaviour.

3.0 Results and Interpretation

3.1 Individual Waste Sorting

One of the main objectives of this project was to find out whether the new bin labels, designed for improved waste sorting accuracy, can improve waste sorting behaviour of individuals on campus. Through our observational data, we found that 38% of individuals sorted correctly with the

current labels, while 36% of individuals sorted correctly with the new labels as shown in *Figure 4*.



Although there was a slight decrease in individual correct sorting with the new bin labels, we conclude that the new labels had no significant effect on waste sorting behaviour at the individual level.

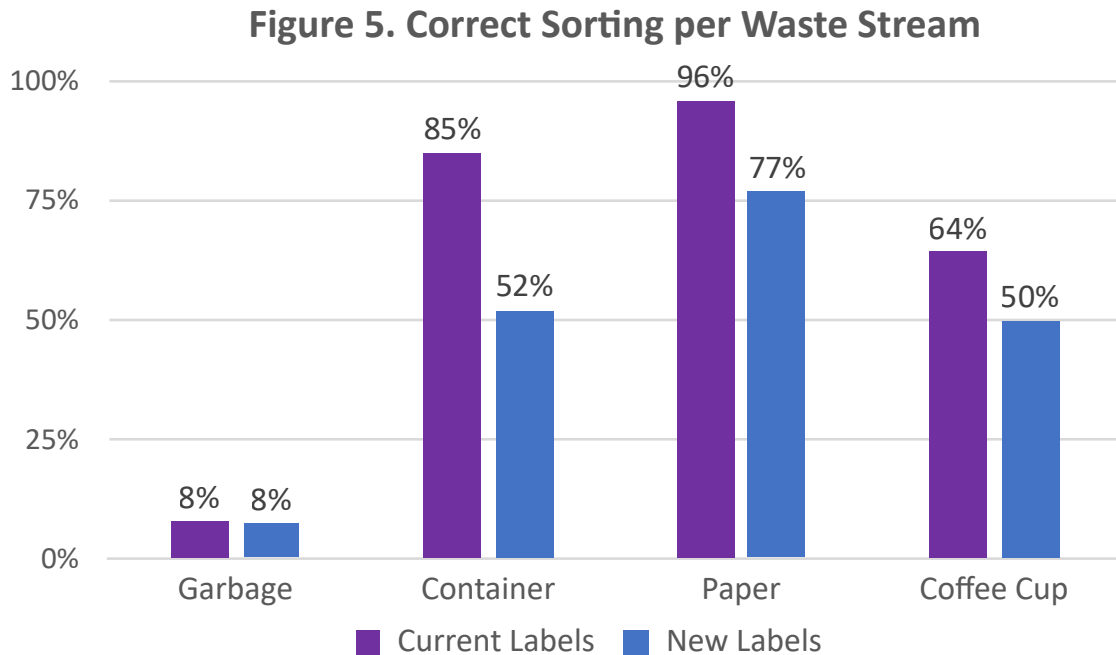
If correct **overall** sorting **at the individual level** didn't improve, perhaps the gap between an individual's actual and perceived behaviour was reduced with the new bin labels. In the pre-intervention, we identified a gap between how individuals perceive their waste sorting and how they actual sort their waste: 76% of the survey **respondents** who sorted incorrectly rated their items easy or very easy to sort. The reason why this behavioural gap is so important is that those who sorted incorrectly and rated the sorting process easy can be using subconscious or habitual mental processes, as such sorting waste never appears hard because they aren't using any major cognitive or conscious processes. To improve waste sorting amongst these individuals, waste sorting needs to be either brought forth into the conscious mind, or habits **need to be** changed.

Results from our post-intervention reveal that this behavioural gap was reduced by about 30%: 47% of the survey responders who sorted incorrectly rated their items easy or very easy to sort. We suggest from this finding is that the new labels changed habitual and subconscious behaviour of incorrect sorters to some extent, which is a positive step in improving waste sorting amongst these individuals.

3.2 Waste Stream and Item Sorting

Waste sorting was analyzed not only at the individual level, but also at the waste stream and item level in order to obtain a more in-depth understanding on the effectiveness of the new bin labels. At the waste stream level, *Figure 5* demonstrates that correct sorting decreased for almost all the

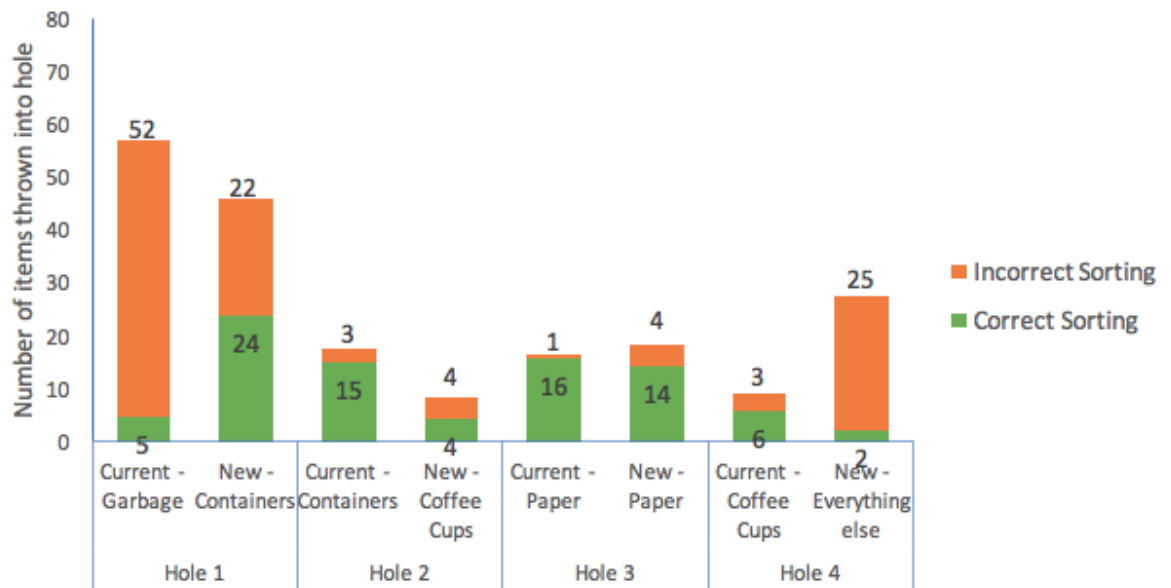
waste streams except for garbage, which maintained the same waste sorting accuracy during the pre- and post-intervention at 8%.



These results were disappointing, especially regarding the garbage stream because this stream had the lowest correct sorting accuracy with the current labels. During the post-intervention, we changed the label for garbage but also the placement of the garbage hole from the hole 1 (first left hole) to hole 4 (first right hole) under the assumption that changing the garbage hole to hole 4 will force individuals to read the labels, evaluate whether their item goes into other waste streams, and use the garbage hole as a ‘last resort’, which would ultimately improve garbage sorting accuracy and reduce the amount of garbage U of T is sending to the landfill. However, it appears from our results that correct garbage sorting didn’t improve with the new labels.

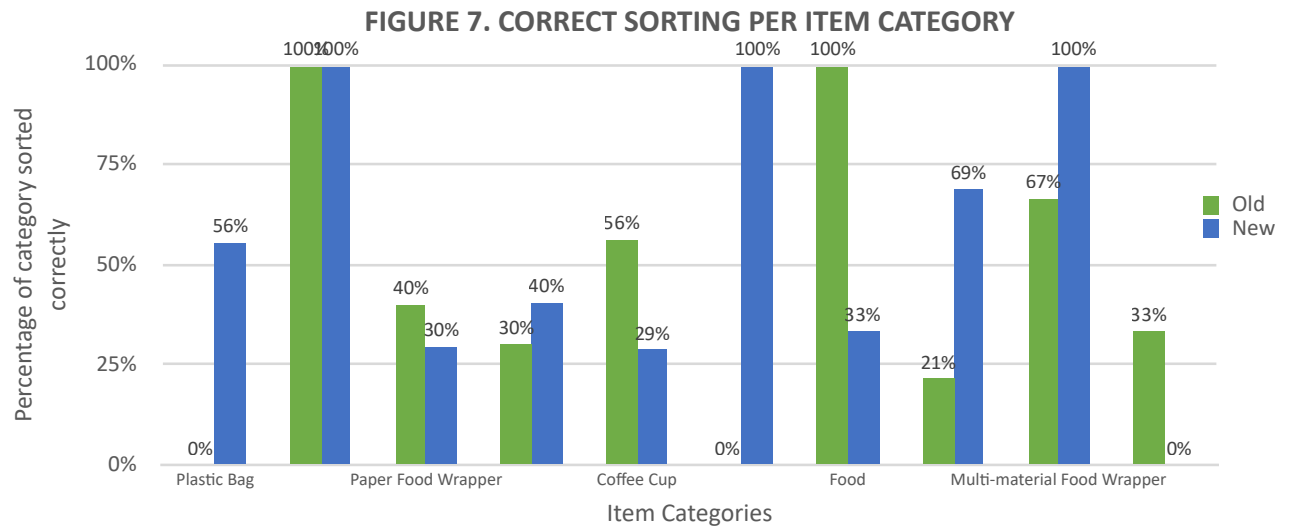
What about the frequency of garbage being thrown away into the garbage hole? Below in *Figure 6*, 57 items were thrown in the garbage stream when the garbage was hole 1 in the pre-intervention, and 27 items were thrown into the garbage stream when garbage was hole 4 in the post-intervention.

Figure 6. Frequency of Bin Hole Usage



This demonstrates that although garbage was sorted with the same accuracy between pre- and post-intervention (as shown in *Figure 5*), the amount of garbage thrown into the garbage hole significantly decreased in the post-intervention (as shown in *Figure 6*). However, changing the bin hole order surfaced a new problem: the container stream, being placed as hole 1, received 155% more items and also 33% more contamination in the post-intervention. We conclude there is a trade-off: the stream placed in hole 1 will receive more items but the accuracy of waste being sorted into that stream will go down.

In terms of waste sorting at the item level, *Figure 7* shows that correct waste sorting improved for half of the item categories. It is worth noting that the most frequently thrown out item category is food container and cutlery, accounting for 30% of the observed waste in this entire project. Also, this category is one of the most poorly sorted categories behind plastic bags and aluminum cans in the pre-intervention. As shown in *Figure 7*, the new labels improved correct waste sorting of the food container and cutlery category by 48%.



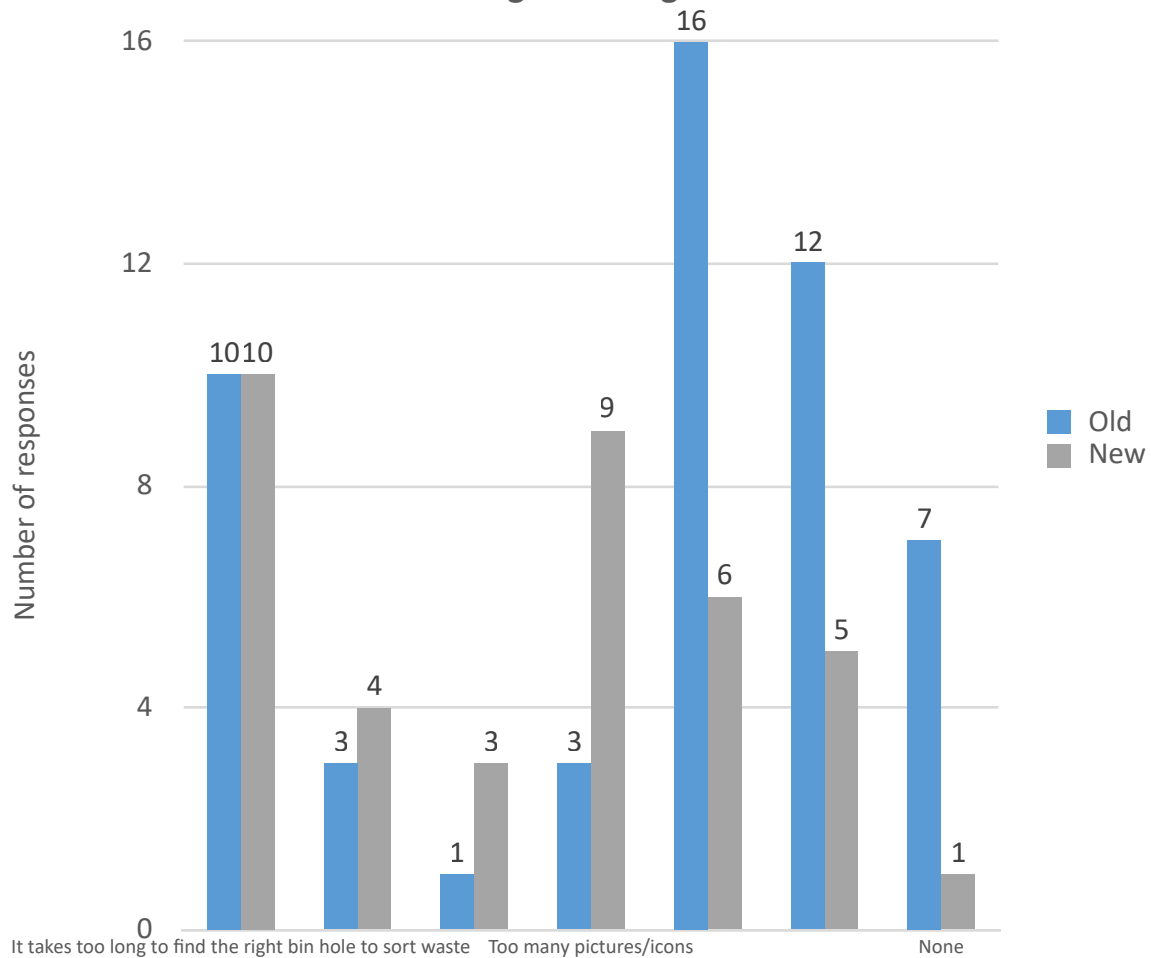
Note: The glass bottle category was omitted from this graph because zero glass bottles were recorded in the current label observations, and three glass bottles were recorded in the new label observations; thus, there was no comparison between the two label systems for this item category.

The improvement in correct sorting of the food container and cutlery category was due to a combination of changing the labels, the bin hole sizes and the bin hole order in the post-intervention. For instance, the new container labels were placed above a large rectangular bin hole on the waste bins, which increased correct sorting as many of the containers could now fit into the bin hole. Also, the new container hole was placed as hole 1 (first left hole) and since individuals tend to use hole 1 the most, correct waste sorting of the food container and cutlery category increased simply through increased usage of this hole.

3.3 Influences on incorrect waste sorting behaviour

Finally, our last finding relates to understanding the factors that influence and contribute to incorrect waste sorting behaviour on campus. Through our survey we asked individuals to select aspects about the waste bins in Sidney Smith that make waste sorting confusing or difficult. Findings from this question are in *Figure 8*. As shown, the majority of respondents in the pre-intervention selected ‘lack of information on how to sort items’ and ‘shape of the openings don’t work well’; however, there was a significant decrease in the number of times individuals selected this answer in the post-intervention, which suggests that individuals perceived the new labels to provide better information and better bin hole item alignment compared to the current labels.

Figure 8. What aspects about SS waste bins make waste sorting confusing or difficult?



4.0 Limitations

There were several issues that may have limited the scope of our study or our results, most of which were out of our control and some of which were unforeseen issues that arose during the course of the project. Limitations included the short exposure of the bin labels post-treatment, changes in the order of waste streams, sample size issues, the inability to properly see waste being disposed (i.e. “visual limitations” in observations), and the fact that survey respondents would have been able to infer that our research was regarding campus bins and signage (since our survey questions were about that). These issues are expounded upon below.

4.1 Limitations on Study Design and Set-Up

The new labels were replaced only two weeks before our post-intervention observations and surveys. This meant that while some ‘users’ may have had weeks, months or even years to get used to the current labels, people had a very short window of time to get used to the new ones. This is supported by the fact that only a little over half of respondents (55%) noticed the labels had been changed. The large difference in exposure time means that some people who visit Sidney Smith less frequently may have seen the label for the first time on the day of observation (and thrown their item out habitually before realising). Additionally, studies have shown that exposure time and repetition results in habit formation (Jager et al., 2003; Klöckner and Matthies, 2011), and the length of time may not have been long enough to allow for that. Indeed the decrease in correct sorting we observed may have occurred because we were still measuring during an adjustment period.

In addition to changing the labels, the study also changed the order of waste streams. This means that we cannot be sure that any changes in sorting behaviour were influenced by the new labels alone, and not by the new positions of holes for each stream. This also compounds the problem of exposure time and habit forming.

These two issues help explain why data collected for time taken to sort an item out (the time from when someone approaches a bin to when they throw it into a hole) is likely not reliable, since there are several, conflicting reasons that contribute to it: people may take longer simply because of lack of familiarity with the signs, because they were correctly sorting and separating their items, or even because the labels were unclear. As such, longer or shorter times were not an indicator of sorting efficiency.

4.2 Limitations in Data Collection

There are also statistical limitations to our study. This study contained a relatively small sample size of 100 people in a campus that has a student body of over 60,000 people. Also, only Sidney Smith was used as a site of study (because it was the only building where the signs were replaced). There is a possibility that by including different buildings, we may have seen different results: for example, better sorting behavior in a “green” building or near a cafeteria that sells products **with** less packaging that has fewer components to sort.

A major hurdle in data recording was overcoming visual limitations. This related not only to our line of vision from where we were seated and observing people dispose of their waste, but also to the fact that we couldn’t see *inside* of items being disposed. For example, food containers being thrown out may have contained other items (food waste, cutlery, napkins) but we could not identify them. A similar problem occurred with drink cups, where we were unable to ascertain whether they were empty or full. Often, we’d try to resolve this issue by making assumptions (eg. coffee cups are empty, food containers are clean and empty). In cases where it was too difficult to make out items eg. a large plastic bag filled with many items), we had to forego recording. These assumptions may have been simplifications that could have resulted in **in**accuracies in our data.

In the interest of keeping surveys short, questions that profiled the respondent (age, degree, faculty, year of study, etc.) were not asked. This commitment to random sampling meant that (in a few cases) there were people surveyed who did not usually visit Sidney Smith, or were there for the first time. Additionally, there may have been a disproportionate number of ‘correct’ sorters who studied an environmental field of study, that we were unaware of. Because of this, many human, demographic and external influencing factors were not accounted for, that could significantly shed light on factors *unrelated* to signage and infrastructure that affect sorting.

Finally, what is also important to consider as a limitation in this study is in relation to the surveys. Once respondents were engaged, they knew that the questions were to assess, in some way, the efficacy of the bins. As can be seen in *Appendix, Table 2*, there were many more questions asked in the survey than what we have presented within this report. This is because we realised that responses to some questions may not have been a true representation of their beliefs, but more a response to the knowledge that we were asking them to comment on efficacy of bins. Our surveys did little to dispel errors due to this issue, or to verify whether this was the cause for inconsistencies reported data, or whether it was cognitive dissonance arising due to some other issue.

5.0 Recommendations

This study made an attempt to better understand whether the new bin labels were effective in improving waste sorting behaviour on campus. Although the impact of the new labels on waste sorting at the individual or stream level was not significant, improvements in sorting certain item categories, providing superior waste sorting information and better alignment between item sizes and bin holes have provided possibilities for further research. The recommendations for future research and for the Sustainability Office are:

5.1 Recommendations for Future Research

5.1.1 Expand: Sample size, Experiment Sites and Exposure Time

As already mentioned, our study had statistical limitations making our findings less reliable and subject to sampling errors. In order to effectively contribute to the literature surrounding waste sorting behavioural interventions, we recommend that future studies use a statistically significant sample size, which can be collected by assembling a larger research team, obtaining grant funding, or conducting the project over a longer time period. Also, our study was limited to the waste bins at Sidney Smith café, which again is not a very representative site for the entire University of Toronto. For instance, we found that food containers and cutlery were some of the most common items thrown out at the Sidney Smith cafe, but perhaps these items are less relevant elsewhere on campus, and, thus, not as large of an issue as we think. A future study should include multiple sites and waste bins to capture a representative picture of behavioural waste problem on campus. Furthermore, one of the largest limitations of our study was the short exposure time of

the new bin labels. As roughly half of the survey participants noticed the bin label changes, any future interventions regarding waste labels or waste sorting in general should be conducted over a long period, ideally six months to a year, in order to produce more accurate results.

5.1.2 Control the Variables

As our study tested multiple variables at once, including a change in labels, label order and bin hole sizes, we could not ascertain whether our results were attributable to one single variable. Although many studies within the literature do test a combination of interventions at once (WRAP, 2016; Osbaldiston & Schott, 2012), it would still be important to test labels alone to determine whether labels play singular important role in changing waste sorting behaviour.

5.2 Recommendations for the Sustainability Office

5.2.1 Test Labels before Intervention

Although our project was essentially ‘testing’ these new bin labels, we think that having more pre-testing, possibly through focus groups, before trying the labels in a formal experiment could reduce some simple design errors and improve clarity of the labels, and, thus, the outcomes of the study. For instance, many participants mentioned relying on colours to sort their waste, and since the new bins used white backgrounds, this may have caused confusion and possibly lowered the effectiveness of the labels. Therefore, as much feedback and testing as possible before actually trying the labels, or any intervention, in real-life is important.

5.2.2 Change Focus from Labels

In order to serve for a broader scope in the future, the results of the project should be taken into consideration. Rather than solely focusing on “do better labels work”, questions such as “what sends the least amount of waste to landfills” should be incorporated to further understand how the amount of waste to landfills can be minimized by waste interventions. Perhaps labels aren’t the solution, but rather EPR or Procurement or other up or downstream solutions.

5.2.3 Consult with the Procurement Office

Our study found that certain items were not standardized across campus, such as food containers, coffee cups, plastic and paper packaging, which caused difficulty in sorting these items because they are all different around campus. Moreover, U of T does not have a procurement policy to ensure items bought and sold on campus can be recycled. Therefore, the Sustainability Office should consult with the Procurement Office on implementing a sustainability guideline that takes into consideration recyclability of items and standardization of items so that individuals can more easily sort and recycle their items.

6.0 Conclusion

In conclusion, this pre- and post-intervention waste bin label experiment provided some interesting results and avenues for future research. Although the new waste bin labels did not

produce a behaviour change at the individual or stream level, the new labels proved to be effective in improving the waste sorting of certain items, namely the food container and cutlery category, providing more information regarding waste sorting, and better aligning item sizes to bin holes. One major negative consequence of the new labels was an increase in contamination of the container stream, which ultimately results in recyclables going to landfill. Overall, this study showed the importance of an effective study design, and we hope that our recommendations regarding sample sizing, intervention duration, procurement and other waste behaviour interventions be taken into consideration for future studies at the University of Toronto and elsewhere.

Group 3 – Very good work on this project and the report. You've identified a lot of the complexities in your project and done some good work to generate findings and recommendations where you can. I expect that your reflections on limitations and future research will be very helpful to your clients.

Mark: 90%

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8.0 Appendix

Table 1: Item categories and correct sorting

Categories	Items	Correct sorting
Aluminum Can	Any aluminum drink can	Container stream
Chopsticks	Wooden chopsticks	Waste stream
Coffee Cup	Paper coffee cup, lid and paper sleeve	Coffee cup stream
Food	Any food item	Waste or organics stream
Food container and cutlery	Plastic container, styrofoam container, multi-material container (plastic lid with cardboard bottom), paper container (lined with wax), plastic cutlery, french fry cup, soup cup, soft drink cup (lined with wax)	Container stream
Glass bottle	Any glass drink bottle	Container stream
Multi-material food wrapper	Burrito/burger wrapper (lined with foil), granola bar wrapper	Waste stream
Plastic bag	Ziplock bag, plastic bag (any colour)	Container stream
Plastic bottle	Water bottle, juice bottle	Container stream
Paper	clean napkin, used napkin, receipt, scrap paper, writing paper, straw wrapper	Paper stream
Paper food wrapper	Paper bag or wrapping for food, such as the Tim Hortons bag for baked goods.	Paper stream

Table 2: Survey questions for the current and new bin labels

Current label survey questions	New label survey questions
1. What did you just throw out?	1. What did you just throw out?

2. How did you decide in which of the 4 bin holes to dispose your item(s)?	2. How did you decide in which of the 4 bin holes to dispose your item(s)?
<p>3. Can you rate how easy or difficult it was to sort your item(s)?</p> <p style="text-align: center;"> </p> <p>4. Why?</p>	<p>3. Can you rate how easy or difficult it was to sort your item(s)?</p> <p style="text-align: center;"> </p> <p>4. Why?</p>
<p>5. Thinking about the bin as a whole, how would you rate your user experience on the following scale?</p> <p style="text-align: center;"> </p>	<p>5. Thinking about the bin as a whole, how would you rate your user experience on the following scale?</p> <p style="text-align: center;"> </p>
6. Do you recall anything particular about the bin labels? (i.e. a particular colour, icon, text, or feature you remember or find interesting?)	6. Do you recall anything particular about the bin labels? (i.e. a particular colour, icon, text, or feature you remember or find interesting?)
<p>7. What aspects about these bins make waste sorting confusing or difficult? (Select all that apply)</p> <ul style="list-style-type: none"> <input type="checkbox"/> It takes too long to find the right bin hole to sort waste. <input type="checkbox"/> The information on the labels is hard to read. <input type="checkbox"/> Too much text. <input type="checkbox"/> Too many pictures/icons. <input type="checkbox"/> Lack of information on how to sort items. <input type="checkbox"/> Shape of the openings don't work well. <input type="checkbox"/> None <input type="checkbox"/> Other _____ 	<p>7. What aspects about these bins make waste sorting confusing or difficult? (Select all that apply)</p> <ul style="list-style-type: none"> <input type="checkbox"/> It takes too long to find the right bin hole to sort waste. <input type="checkbox"/> The information on the labels is hard to read. <input type="checkbox"/> Too much text. <input type="checkbox"/> Too many pictures/icons. <input type="checkbox"/> Lack of information on how to sort items. <input type="checkbox"/> Shape of openings don't make sense <input type="checkbox"/> None <input type="checkbox"/> Other _____
<p>8. Can you rate how helpful or unhelpful the labels were for helping to sort your item(s)?</p> <p style="text-align: center;"> </p>	<p>8. Did you notice there were new labels?</p> <ul style="list-style-type: none"> <input type="checkbox"/> Yes <input type="checkbox"/> No
9. What are some other items you find confusing to dispose of?	<p>9. Can you rate how helpful or unhelpful the labels were for helping to sort your item(s)?</p> <p style="text-align: center;"> </p>

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	10. What are some other items you find confusing to dispose of?
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