

UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

Sustainability & Convenience at UBC: Are Compostable Bags the Solution?

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Summary/Abstract: This study aimed to explore the relationship between convenience and composting habits. More specifically, does providing compostable plastic bags to students living in The University of British Columbia's Thunderbird Residence increase the prevalence of proper composting? This study used a self-report questionnaire to better understand Thunderbird Residence's composting habits and motivation. Additionally, every week data was collected from Thunderbird Residence's composting facility/bins. Photographs were taken of each compost bin and rated on a plastic contamination scale (ranging from 1-5). Overall, this study found results that were in line with the hypothesis; being given plastic compostable bags was associated with better composting habits. This means that the residence blocks that were given plastic compost bags (blocks 3000 & 5000) had higher scores on the contamination scale, with less plastic contamination and better composting habits.

The Green Girls - Hannah Walsh, Chloë Niderost & Kayla Price

Sustainability & Convenience at UBC: Are Compostable Bags the Solution?

Introduction: First, a question will be explored: why is composting so important? Walker (2009) explained that approximately 61 million tons of yard trimmings, food scraps, and shredded paper are put into landfills yearly in the United States. Further, when compostable items are put into the landfill with plastic waste, they can take "thousands of years to disintegrate" (Walker, 2009, p. 50). Walker (2009) demonstrates the individual benefits of composting: when compostable items are composted into nutrient-rich substances they can be used in one's garden and lawn to decrease water use, improve soil health, and help fight off plant diseases. Walker (2009) also explains why compostable items do not decompose properly in the landfill; this is because landfills do not have the correct balance of nitrogen, carbon, and oxygen.

Next, Van Der Werf (2008) explores some of the more global implications of composting; these include waste diversion, reducing landfill space, "replacing organic matter in the soil and the positive impacts of reducing greenhouse gas emissions" (p. 39). Now that we have covered some background knowledge on composting, we will look specifically at how convenience influences composting. Unfortunately, there are not many studies that have explored the relationship between composting and convenience.

However, there is a study by DiGiacomo et al (2017) which focused on the convenience of green bins on UBC's residence. Overall, they found a 139% increase in composting rates when bins are in the most convenient location possible. This study revealed implications that convenience has over proper composting and recycling. It is demonstrated that convenient strategies, such as providing students with "disposable food waste sorting equipment," increases composting rates by 30% (DiGiacomo et al., 2017, p. 312). Further, 0.66kg of food waste was produced per week before implementing the equipment; after the equipment was installed, food waste rates per week increased to 0.99kg. The researchers hypothesized that if composting and recycling bins were moved closer to students' suites, there would be higher rates of composting and recycling. Indeed, their hypothesis was in line with their results; the most convenient condition had the highest rates of compost diversion. However, this study includes a very interesting topic to be explored: is it actual convenience that influences peoples' composting habits, or is it

perceived convenience? The study by DiGiacomo et al (2017) will be used as a baseline to further implement convenience as well as proper composting into residence life at UBC.

This study will reveal how much convenience impacts our psychological drive to act sustainably in regard to composting habits; in this case, convenience is being given plastic composting bags. Being given these bags may act as a nudge, increase proper composting habits as it is more convenient. Something that should be further studied is whether it is actual convenience or perceived convenience that influences students composting habits. Knowing what kind of convenience is influential is crucial for increasing composting motivation and habits. If perceived convenience is enough to affect people's environmentally friendly habits it should be known to better help our planet.

Research Question & Hypothesis: This study's research question asks if providing compostable bags to students in UBC's residences increases the prevalence of proper composting. This question revolves around the concept of convenience; if composting is more convenient will it be done more frequently and properly? Our more specific research hypothesis is that there will be less non-compostable contamination in the bins where the students are provided with compostable plastic bags. This means the composting units in blocks 1000 and 2000 will have more plastic contamination (a lower score on the contamination scale) and the blocks 3000 and 5000 will have less plastic contamination (a higher score on the contamination scale).

Methods: Using an independent samples design, this study split a Student Housing Residence (Thunderbird Residence) at the University of British Columbia into an experimental condition and a control condition. Residence blocks 3000 and 5000 were assigned to the experimental condition and were given compostable plastic bags. Residence blocks 1000 and 2000 were assigned to the control condition and were not given compostable plastic bags. Every Monday before trash collection, pictures were taken of the interior of the compost bins at each location. We created a Contamination Scale to measure the compost in each bin using our sight and judgment (levels 1-5). It is important to note that we had limited access to resources and were unable to count or objectively measure the compost. This contamination scale measured what percentage of the items in the compost was actually compostable, with level 1 being the most contaminated (80-100% contamination) and level 5 being the least contaminated (0-20% contamination) (See Appendix F). Based on our hypothesis, we expected that the control condition would yield lower scores on our scale, and therefore be more contaminated; and that the experimental condition (independent variable) would yield higher scores on the scale (dependent variable) and be less contaminated. Some residence blocks contained more compost bins than others, so, to keep consistent with our study, we took the average contamination score of the bins at each location per week, across 5 weeks of data collection.

In addition, a self-report survey was sent to both the residents involved in the study, as well as the general student body at UBC. The survey asked various questions about demographics as well as composting practices and attitudes (See Appendix D & E). Thunderbird composting data collection only began a few weeks after compostable bags were given. Therefore, this survey acted as a baseline for the sustainable habits of those living in Thunderbird Residence, and how those could be compared to the general population of UBC.

It is unknown how many participants this study actually had, considering our measures were only of the participant's collective contamination and not taken on an individual basis. In addition, classes at UBC were moved online due to the COVID-19 outbreak right before week 4 of the study. Because of this, it is presumed that many residents left during this time, and so not only is the total number of participants unknown but it likely fluctuated throughout the duration of the study. As for the surveys, we collected 125 total responses in Thunderbird Residence and 78 for the UBC population. The motivation for general UBC students to take the survey was the possibility of winning a \$35 gift card.

Results: We completed three different statistical analyses in order to test our hypothesis. First, we ran an independent samples t-test for the contamination level of each Thunderbird block; our data points were the average contamination level of the compost bins at each block for 5 weeks ($N=10$). After running the test, we were able to determine that giving students compostable plastic bags yields a 40% increase in composting habits. Therefore, we see a large decline in putting plastic and other non-compostable items in the compost bin (See Appendix A for tables and statistical data). One thing to note is that the majority of contamination found was plastic bags, as students were using plastic non-compostable bags for their compost. Our client, Bud Fraser mentioned this issue prior to the study, but it drastically separated what was in the compost for the control and experimental conditions. Other common contaminants included large pizza boxes, paper bags, and various plastic food packaging.

We also ran an independent samples t-test on the survey responses in each condition in Thunderbird Residence ($N=114$), testing for whether the answers differed to: "do you currently use a compost bin in your residence/where you live?"; "how important is composting to you?"; and "are you aware of the benefits that composting has on the environment?" (See Appendix D). We were able to determine that the answers to "how important is composting to you?" were the same in both conditions, however the experimental condition reported using a compost bin in residence and being aware of composting's impacts more than the control condition (See Appendix B). This relationship is small but still noteworthy; the experimental condition was already several weeks into using free compostable bags, possibly swaying their answers on the survey.

We ran a final independent samples t-test comparing the responses to the same three questions for Thunderbird Residence's survey as for UBC's survey to determine whether the students at Thunderbird Residence were representative of the general student population ($N=201$). UBC and Thunderbird Residence appeared to have a similar level of awareness for the benefits of composting on the environment. However, the UBC population seems to compost more in their homes and holds a higher importance of composting in their lives than Thunderbird Residence (See Appendix C). These results show that overall, our Thunderbird sample for the study valued composting and acted sustainably far less than the general student body at UBC. Further, this holds more weight for the drastic changes in sustainable habits as seen when students are given compostable plastic bags.

Contribution to UBC: If our hypothesis is supported, it could be useful to further distribute compostable plastic bags to more UBC residents in hopes of increasing the amount they compost. This study has the potential to better composting habits across campus and can increase awareness of the importance of proper composting.

Possible Implications: Our results will show how much convenience contributes to raising or lowering composting practices as well as how money on an individual level (e.g., buying compost bags yourself) contributes to an increase in sustainability practices. Further studies could analyze how convenience (money and time) change with the demographic of the population (e.g., young adults could be more influenced by convenience than older adults).

Discussion: This research aimed to answer the question of whether providing compostable plastic bags to students in UBC's Thunderbird Residence increases the prevalence of proper composting. Our results suggest that yes, providing compostable plastic bags does significantly increase the rate of proper composting in Thunderbird Residence. If this study were to be replicated, a semester long data collection time would be ideal as well as a more in-depth exploration of the composting bins. We did not have access to the proper resources to fully go through the green bins, rather just take a quick look at what is visible. This limited our findings to an estimate of contamination. Next, we will discuss the many limitations of our study.

Our findings do not directly show that the convenience of being given compostable bags is the definite causation of proper composting. Composting accuracy could be due to perceived convenience or the psychological nudge of always having accessible compostable bags to use. In our experience, plastic bags are often hard to come by on UBC campus. Our results could also be due to the fact that Thunderbird residents were given plastic bags, and compostable or not, might have used them for their green bin regardless. For future studies, it would be ideal to provide an experimental group with both compostable green bags and plastic garbage bags and analyze the compost bins to see if proper composting is still being abided by. It would also be interesting to study whether it is actual or perceived convenience influencing students' composting habits. The study by DiGiacomo (2017) suggested for this phenomenon to be studied further; perceived convenience could possibly boost recycling and composting rates without physically changing the location of bins. If future studies revealed that perceived convenience increases environmentally friendly habits, it could be extremely helpful for the planet.

Another limitation of this study was the survey that we distributed to both general UBC students as well as students living in the Thunderbird Residence. There was a fascinating discrepancy in which most students, both general and Thunderbird residents placed a high value on self-reported importance of composting, a high level of current composting, and reported especially high levels of awareness of the environmental benefits of composting (See Appendix B). However, these survey responses did not necessarily show through the waste results. This could be due to the perceived idea that residents know what is and is not compostable, when compostable items differ by city and might not be properly communicated to UBC residents. This discrepancy also shows the limitation of surveys in psychological research in that a reported level of importance and understanding of the topic may not always show through behaviours.

This study showed an interesting phenomenon in which as the weeks progressed, the control group's contamination level decreased, meaning that they too were increasingly improving in their composting habits, even without being given compostable bags. In block 1000, the contamination level went down from 40% to 0% and in block 2000 the contamination level went down from 76% to 65%. It is also interesting to note how highly sustainable block 2000 appears to be in the survey results (see Appendix B). We suspect

that this phenomenon could be due to the influence of the experimental condition in that watching other residents practice proper composting might have influenced the control group to do the same. In addition, what can be composted varies by location, therefore, many of the contaminants found could have been composted elsewhere. A final limitation is that our Contamination Scale could prove confusing to some, as higher levels of the scale represented high levels of composting, not contamination, as one might assume.

Though this research did have some challenges, the results do still support the idea that providing Thunderbird residents with compostable bags increases the overall accuracy of proper composting. The idea that perceived convenience increases composting is relevant in both UBC life and to the general population in that environmental sustainability may be increased by a psychological nudge towards better composting habits. This study should act as an initiative to provide all UBC residents and eventually provincial residents with the correct nudge; free compostable bags or the ability to watch others compost correctly could promote proper composting and environmental sustainability as a whole.

Recommendations: Our research has revealed how convenience plays a large role in composting habits and motivation in UBC's Thunderbird Residence. Our results concluded that Thunderbird blocks that were given free compostable bags had a significant higher rate of proper composting (see Appendix A). This could be due to a mix of convenience as well as the monetary aspect of purchasing compostable bags on one's own. Through this evidence, we are inclined to recommend that UBC Residence provides compostable bags to all residents with kitchens for the duration of their stay. Though this is quite an investment to provide residents with compostable bags every semester, it aligns with UBC SEEDS goal of "generat[ing] innovate sustainable solutions that use the Campus as a Living Laboratory" as well as their five year plan to "maintain & enhance urban biodiversity" (UBC SEEDS Sustainability Program, 2014). UBC's 2014 more specific Zero Waste Action Plan of an 80% decrease of waste by 2020 (p. 3) could have the potential be greatly impacted by giving residents compostable bags as well as the education on how to use them correctly. In addition, it is apparent that the majority of compost contamination is plastic bags being used as compost bags, which could be greatly improved by giving residents compostable bags.

Project Difficulties & Delays: We had a few difficulties and delays surrounding our research. This includes: the COVID-19 pandemic that prevented us from continuing research on campus for additional weeks and trouble communicating with the Residence Life manager at Thunderbird Residence who did not send out our supposed-to-be baseline survey until the final weeks of data collection. Despite the delay in survey release, we ended up getting over 200 responses by both Thunderbird Residents as well as other UBC students. The COVID-19 pandemic cut our data collection two weeks short in that we were not able to get on campus to analyze the compost bins. Despite some difficulties and delays, our client, Bud Fraser, provided the Thunderbird Residence experimental group with compostable bags at the beginning of the semester and was open to helping us and answering any questions we might have.

References

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- Walker, R. O. (2009). Why compost? *Delicious Living*, 25(4), 50. Retrieved from <https://search.proquest.com/docview/220512839>

Appendix A

Thunderbird Residence Contamination Results - Statistical Analysis

Independent Samples T-Test

Independent Samples T-Test

		statistic	df	p	Mean difference	SE difference	95% Confidence Interval	
							Lower	Upper
Contamination Level (CL)	Student's t	2.72	18.0	0.007	1.13	0.415	0.407	Inf

Note. H_a Experimental > Control

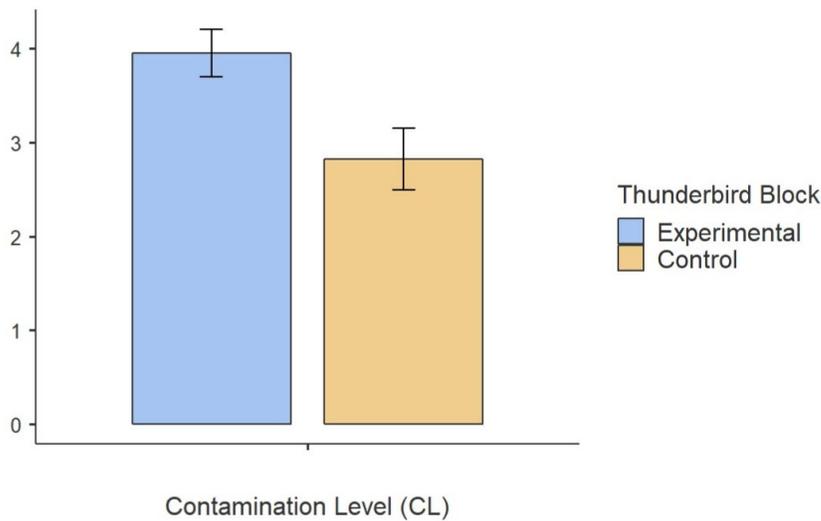
Group Descriptives

	Group	N	Mean	Median	SD	SE
Contamination Level (CL)	Experimental	10	3.95	3.75	0.798	0.252
	Control	10	2.82	2.75	1.04	0.330

Thunderbird Residence Contamination Results - Table 1

Plots

Contamination Level (CL)



Appendix B

Thunderbird Residence Survey Results - Statistical Analysis

Independent Samples T-Test

Independent Samples T-Test

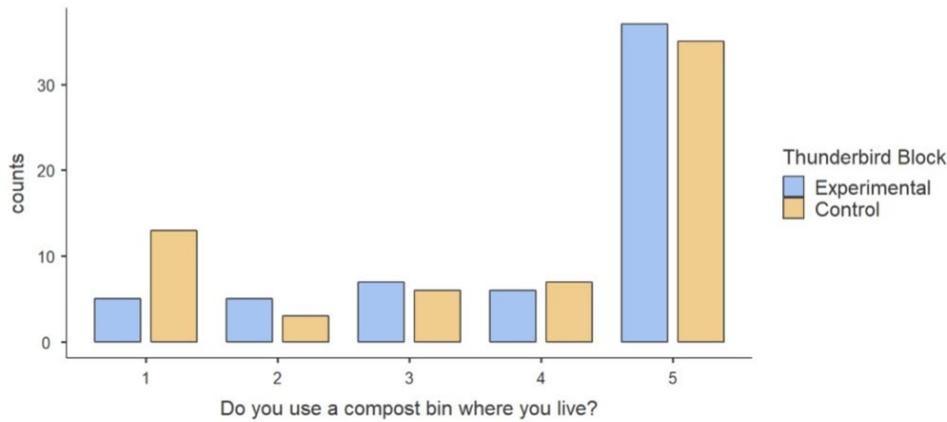
		statistic	df	p	Mean difference	SE difference	95% Confidence Interval	
							Lower	Upper
Do you use a compost bin where you live?	Student's t	1.236*	122	0.219	0.3333	0.2696	-0.200	0.867
How important is composting to you?	Student's t	0.560	123	0.577	0.0676	0.1208	-0.171	0.307
Are you aware of composting's benefit on the environment?	Student's t	0.839	123	0.403	0.0815	0.0971	-0.111	0.274

* Levene's test is significant (p < .05), suggesting a violation of the assumption of equal variances

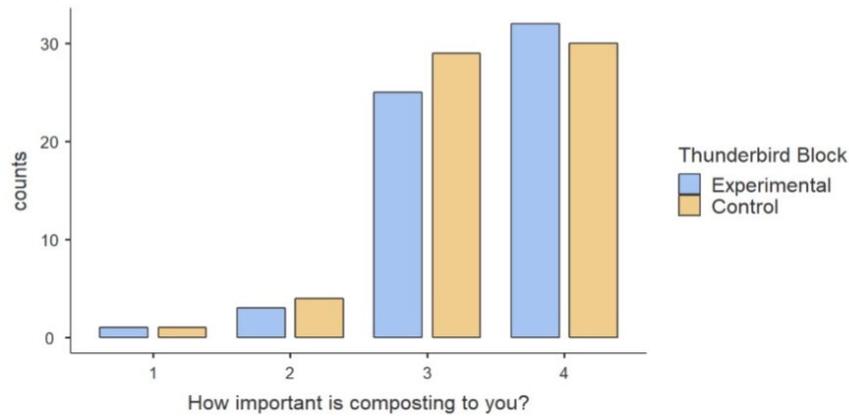
Group Descriptives

	Group	N	Mean	Median	SD	SE
Do you use a compost bin where you live?	Experimental	60	4.08	5.00	1.357	0.1751
	Control	64	3.75	5.00	1.623	0.2029
How important is composting to you?	Experimental	61	3.44	4.00	0.671	0.0860
	Control	64	3.38	3.00	0.678	0.0848
Are you aware of composting's benefit on the environment?	Experimental	61	2.74	3.00	0.545	0.0697
	Control	64	2.66	3.00	0.541	0.0676

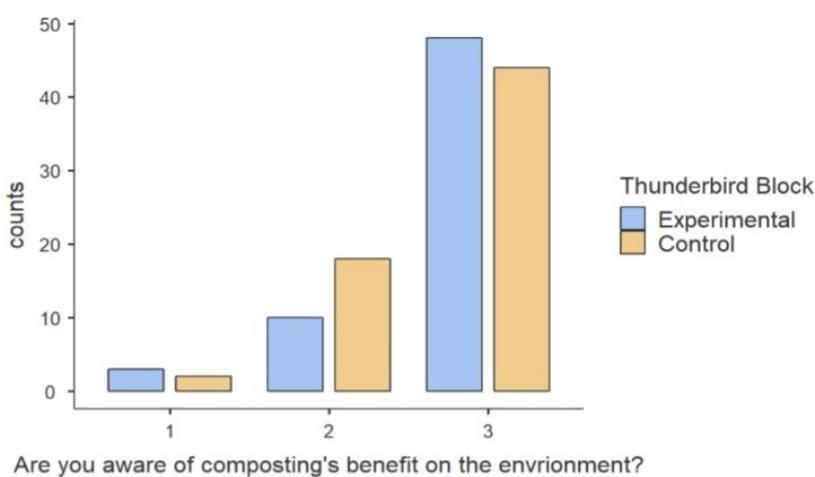
Thunderbird Residence Survey Results - Table 2



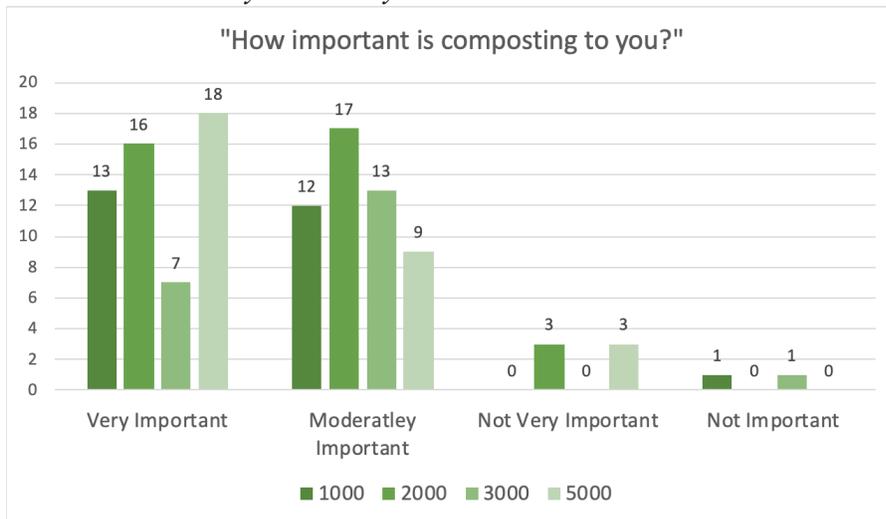
Thunderbird Residence Survey Results - Table 3



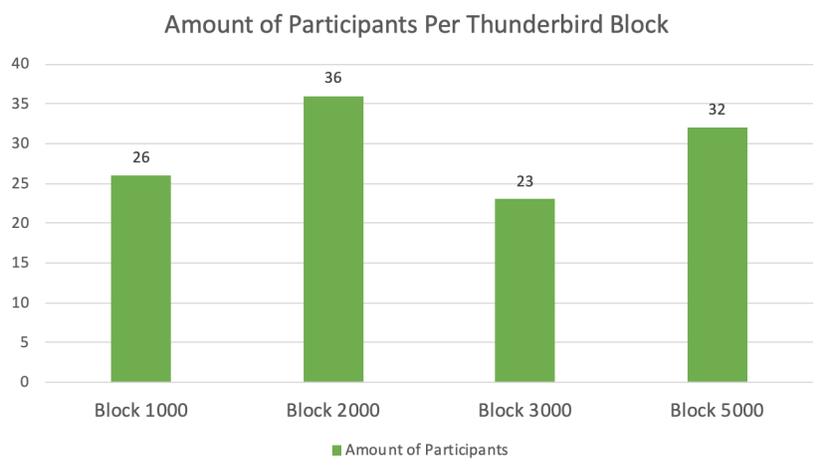
Thunderbird Residence Survey Results - Table 4



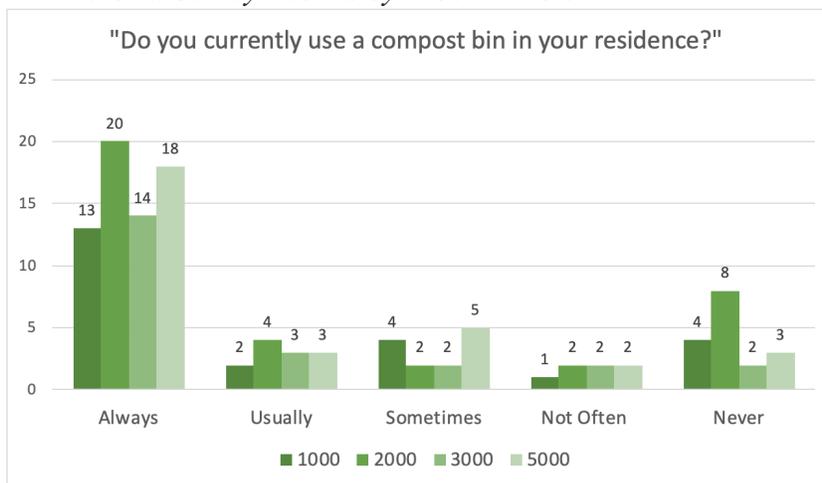
Thunderbird Survey Results by Block - Table 5



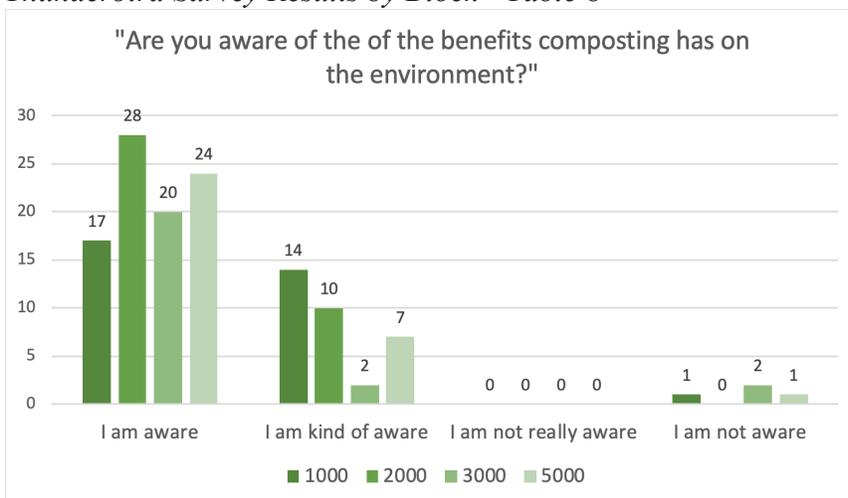
Thunderbird Survey Results by Block - Table 6



Thunderbird Survey Results by Block - Table 7



Thunderbird Survey Results by Block - Table 8



Appendix C

Thunderbird Residence & UBC Survey Results - Statistical Analysis

Independent Samples T-Test

Independent Samples T-Test

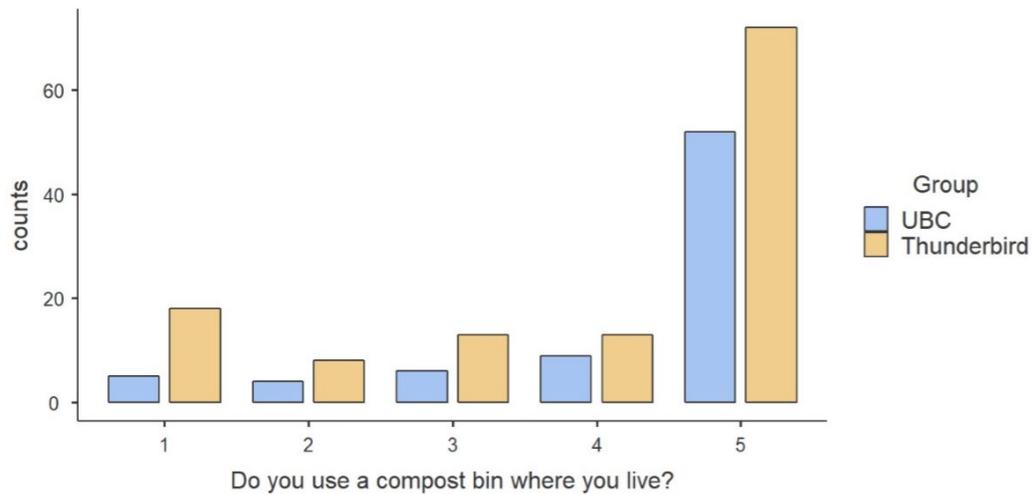
		statistic	df	p	Mean difference	SE difference	95% Confidence Interval	
							Lower	Upper
Do you use a compost bin where you live?	Student's t	1.914 ^a	198	0.057	0.3913	0.2045	-0.0119	0.795
How important is composting to you?	Student's t	0.967	199	0.335	0.0920	0.0952	-0.0957	0.280
Are you aware of composting's benefit on the environment?	Student's t	-0.487	199	0.627	-0.0381	0.0782	-0.1924	0.116

^a Levene's test is significant (p < .05), suggesting a violation of the assumption of equal variances

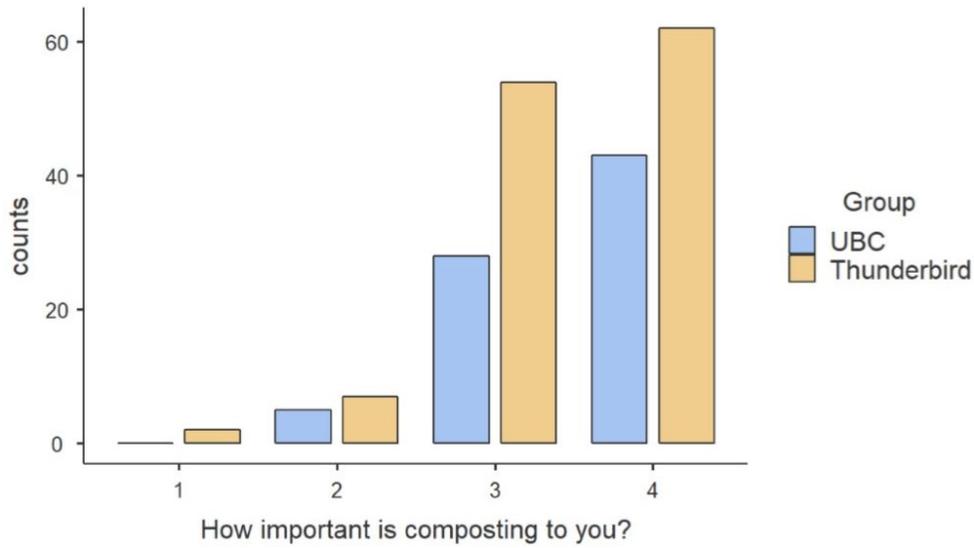
Group Descriptives

	Group	N	Mean	Median	SD	SE
Do you use a compost bin where you live?	UBC	76	4.30	5.00	1.222	0.1402
	Thunderbird	124	3.91	5.00	1.503	0.1350
How important is composting to you?	UBC	76	3.50	4.00	0.622	0.0713
	Thunderbird	125	3.41	3.00	0.673	0.0602
Are you aware of composting's benefit on the environment?	UBC	76	2.66	3.00	0.530	0.0608
	Thunderbird	125	2.70	3.00	0.542	0.0485

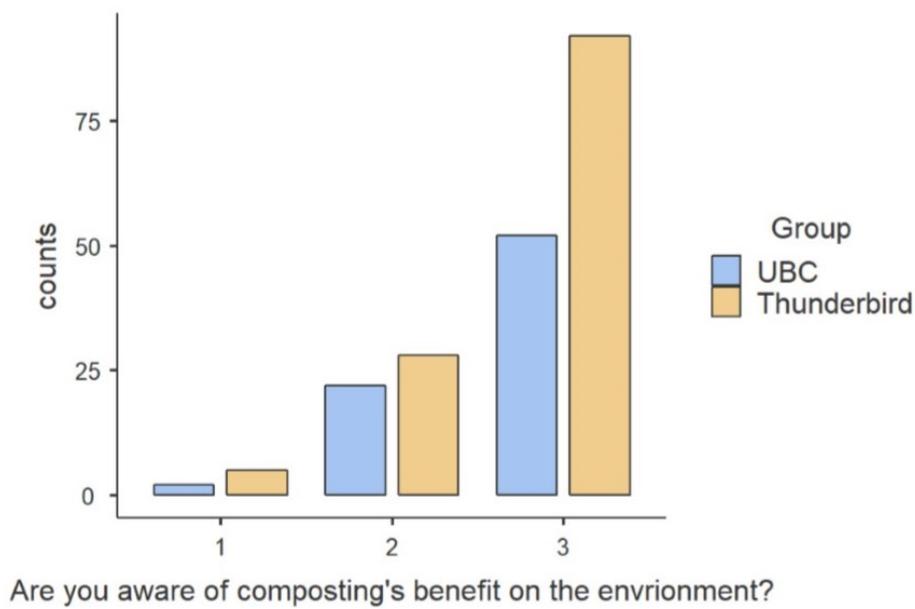
Thunderbird Residence & UBC Survey Results - Table 9



Thunderbird Residence & UBC Survey Results - Table 10



Thunderbird Residence & UBC Survey Results - Table 11



Appendix D

Compost Motivation Thunderbird Survey:

Qualtrics Survey Link: https://ubc.ca/qualtrics.com/jfe/form/SV_9XLGfsrEJ9rmmCV

What year are you in at UBC?

Second

Third

Fourth

Fifth +

Graduate Student

What gender do you identify as?

Gender Non-conforming

Non-binary

Transgender

Female

Male

Other

Prefer not to answer

What Thunderbird Residence Block do you live in?

1000

2000

3000

5000

Do you currently use a compost bin in your residence?

Always

Usually

Sometimes

Not often

Never

How often do you put compostable items (food scraps, paper towels, napkins, etc.) in a compost bin?

Always

Usually

Sometimes

Never

When discarding a food or compostable item on campus, do you usually look for a green compost bin to use?

All the time

Usually

Sometimes

Never

Are you aware of how much plastic contamination is in UBC's composting facility?

Yes I am aware

I am kind of aware

I am not really aware

I am not aware

How important is composting to you?

Very important

Moderately important

Not very important

Not important at all

Are you aware of the benefits composting has on the environment?

I am aware

I am kind of aware

I am not aware

How happy are you with UBC's current composting practices and awareness? E.g., are you happy with the amount of composting bins placed around UBC's campus?

Happy

Somewhat happy

No opinion

Somewhat unhappy

Unhappy

How happy are you with Thunderbird Residence's composting practices?

Happy

Somewhat happy

No opinion

Somewhat unhappy

Unhappy

Could you please elaborate on your satisfaction with UBC and Thunderbird Residence composting practices?

If you would like to enter the draw for a \$35 gift card to the UBC bookstore, please write your email here

Appendix E

Compost Motivation Baseline Survey (all UBC students):

Qualtrics Survey Link: https://ubc.ca1.qualtrics.com/jfe/form/SV_6uv33KgCHO8IMTP

What year are you in at UBC?

First

Second

Third

Fourth

Fifth +

What gender do you identify as?

Female

Male

Other

Prefer not to answer

Do you live on UBC campus (during the school year)?

Yes

No

Do you live in Thunderbird Residence?

Yes

No

Do you currently use a compost bin where you live?

Always

Usually

Sometimes

Not often

Never

How often do you put compostable items (food scraps, paper towels, napkins, etc.) in a compost bin?

Always

Usually

Sometimes

Never

When discarding a food or compostable item on campus, do you usually look for a green compost bin to use?

All the time

Usually

Sometimes

Never

Are you aware of how much plastic contamination is in UBC's composting facility?

Yes I am aware

I am kind of aware

I am not really aware

I am not aware

Do you think that if you were given compostable plastic bags (with handles) to use for composting, your composting habits would improve?

Yes

Maybe

No

How important is composting to you?

Very important

Moderately important

Not very important

Not important at all

Are you aware of the benefits composting has on the environment?

I am aware

I am kind of aware

I am not aware

How happy are you with UBC's current composting practices and awareness? E.g., are you happy with the amount of composting bins placed around UBC's campus?

Happy

Somewhat happy

No opinion

Somewhat unhappy

Unhappy

How happy are you with Thunderbird Residence's composting practices?

Happy

Somewhat happy

No opinion

Somewhat unhappy

Unhappy

Could you please elaborate on your satisfaction with UBC and Residence composting practices?

If you would like to enter the draw for a \$35 gift card to the UBC bookstore, please write your email here

Appendix F

5-Level Contamination Scale:

Contamination Level 1 (CL1): 80-100% of items found in the compost are not compostable (contaminated)

Contamination Level 2 (CL2): 60-79% of items found in the compost are not compostable (contaminated)

Contamination Level 3 (CL3): 40-59% of items found in the compost are not compostable (contaminated)

Contamination Level 4 (CL4): 20-39% of items found in the compost are not compostable (contaminated)

Contamination Level 5 (CL5): 0-19% of items found in the compost are not compostable (contaminated)

5-Level Contamination Scale - Compost Data Examples:

Block 1000 - CL 1



Block 2000 - CL 2



Block 3000 - CL 5



Block 5000 - CL 4

