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Identifying Effective Communication Tools to Promote Composting

Observations on Composting Behavior in UW Resident Hall Cafeterias

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Executive Summary

This report synthesizes the results of composting behavior observations in the University of Washington resident hall cafeterias Eleven 01 and The 8. The main objective of the project is to identify perceived motivations and barriers the campus community has to composting, and determine what methods would be most effective in fostering behavior change. This project addresses aspects of campus sustainability outlined in the University's Climate Action Plan, which identifies the importance of waste reduction as a means to reducing greenhouse gas emissions.

Two stages of observations have been conducted, including initial observations of the composting infrastructure (compost areas, compost containers, and compost signs), and secondly looking at individual's composting behavior and collecting data on possible factors that influence composting behavior. In the course of 18 hours, 1372 individuals were observed. The majority of individuals exhibited desirable composting behavior, with exactly 75% (1029) composting all of their compostable materials. Of the individuals who displayed undesirable composting behavior: 39.9% (137) disposed their garbage in the compost bin; 39.4% (135) disposed their compost in the garbage bin; 7.9% (25) disposed their recycling in the compost bin; and 1.5% (5) disposed their compost in the recycling bin.

The following factors showed a significant affect on the likelihood of an individual engaging in desired composting behavior:

- Individuals were more likely to compost correctly at Eleven 01 than at The 8.
- Students engaged in desired composting behavior more than individuals who were not students (75.8% compared to 64.2%).
- Frequent exposure to signs at the beginning of the academic year seemed to be a major influence on students who composted.
- Individuals who used reusable ceramic plates were more likely to engage in desired composting behavior (79.8%) compared to those using disposable plates (72.5%).
- Individuals who could view the compost from their table engaged in desirable composting behavior 90.0% of the time compared to 74.5% for those who could not see compost from where they sat.
- Individuals with the prospect of social influence engaged in desired composting behavior 89.9% of the time compared to 72.2% of individuals with no social influence.
- As level of crowd increased the likelihood of engaging in desired composting behavior increased.
- Individuals with the greatest distraction composted correctly only 25.0% of the time compared to 75.0% of individuals with no distraction.

The following implementations are recommended to increase composting behavior in campus cafeterias:

- Clearly label each compost, recycling and garbage container, and have separate colors for each container.
- Arrange compost, recycling, and garbage containers in a row.
- Influence behavior earlier in the process of eating at the cafeteria by having signs in areas where individuals are receiving compostable items that indicate whether they are compostable, recyclable, or garbage.
- Increase ceramic plate use by encouraging staff and individuals to use ceramic plates if they are eating in the cafeteria, or not offering takeout containers.
- Decrease the use of non-compostable materials in cafeterias.

- Place signs in other areas besides above compost containers and place containers in views of eating areas.
- When using signs, use the following messaging strategies:
 - Prompt method saying how to dispose of the item. For example, “Please recycle your milk carton.”
 - Use social norms to influence behavior. For example, set up a message such as, “The majority of individuals in this cafeteria compost food scraps correctly.”

Introduction

This brief report synthesizes the results of observations on composting behavior in the University of Washington resident hall cafeterias. This report is the first presented as part of our applied research project working to promote composting behavior at the UW. The main objective of this project is to identify the perceived motivations and barriers the campus community has to composting, and determine what communication methods can effectively foster behavior change. Behavior observations are the first step in this project, which provides baseline information to identify what improvements in current behavior are needed. This report describes some background for the project, the methods for inquiry, and key findings from this initial inquiry.

Composting Behavior on Campus

This behavior change project focuses on student composting in the University of Washington residence dining facilities. The main objective of the project is to identify perceived motivations and barriers the campus community has to composting, and determine what communication methods would be most effective in fostering behavior change. We hope our findings and recommendations will be useful for a variety of campus institutions including: Housing and Food Services (HFS), UW Recycling & Solid Waste, Building Services, and student led groups such as SEED.

This project addresses aspects of campus sustainability outlined in the University's Climate Action Plan (CAP). The CAP identifies the importance of waste reduction as a means to reducing greenhouse gas emissions (pg. 51-53). Increasing food composting on campus is cited as an area of interest because increasing the amount of waste that is composted achieves the following: waste reduction by limiting landfill, recycling of nutrients, and the reduction of greenhouse gases through a more efficient waste management system.

HFS has made concerted efforts to increase composting on campus, and the availability of compost bins across the University of Washington campus has increased in recent years. However, even with this service available, there is lack of participation of students, and compost bins are often contaminated. Contamination occurs when non-compostable items such as plastics, metal, or specially treated paper ends up in the compost bin. When Cedar Grove Composting facility picks up compost the drivers examine the bins, and record the contamination discovered. After being sorted out at their facility, photos are taken of the contamination, and a back charge is sent to the hauler (Personal Communication, Cedar Grove July 2011).

Furthermore, CAP reflects the importance of behavior change, stating that approximately 20% of the necessary green house gas reductions are planned to be achieved through behavior change (pg. 26). This project seeks to identify behavior change strategies that will be effective at promoting composting. Research will determine the most effective strategies, which may benefit additional sustainability initiatives.

Methods

Observations

To date we have conducted two stages of observations. The first stage included initial observations to look at the composting infrastructure (compost areas, compost containers, and compost signs) present in the dorm cafeterias. The second stage included looking at individual's composting behavior and collecting data on possible factors that influence composting behavior.

Stage 1: Gaining General Knowledge of Composting Infrastructure

During this stage, we observed compost infrastructure in the two resident hall cafeterias—Eleven 01 and The 8. We conducted twelve observations over the course of two weeks. We varied the times of observation to ensure we captured breakfast, lunch, and dinner crowds and staggered them throughout the week to see if there was variation in behavior throughout the week. Along with identifying compost infrastructure, we collected initial qualitative information on compost behavior. This information was then used to identify factors that might influence composting behavior, which we investigated in depth through stage two of observations.

Stage 2: Structured Observations of Composting Behavior and Behavior Influences

Based on the knowledge gained from stage one of the observations, we created a tally sheet to efficiently mark off the behaviors that each individual was displaying. This would allow us to determine exactly how many people were exhibiting what behaviors. Beyond just observing individual behavior, we also observed various factors that might influence composting behavior. Table 1 lists both the behaviors and the possible influence factors that we observed.

Table 1. Measures Taken During Stage 2 Observations

Composting Behavior	Measures of Factors that Might Influence Composting Behavior
<ul style="list-style-type: none">• Compost Correctly• Compost Incorrectly<ul style="list-style-type: none">○ Compost in garbage○ Compost in recycling○ Garbage in compost○ Recycling in compost	<ul style="list-style-type: none">• Cafeteria• Meal time• Gender• Plate type (reusable/non-reusable)• Whether individual looked at signs• Whether individual could see compost while eating• Social influence• Level of distraction• Level of crowd• Level of confusion

Composting Contamination Levels

Along with behavior observations, we wanted to collect data on compost container contamination. We established a Likert scale rating from one to five for contamination levels (Table 2). Twice a week (at each cafeteria) during spring quarter, we rated contamination levels of compost containers waiting to be picked up by Cedar Grove. These ratings allowed us to compile baseline data to evaluate the success of future interventions.

Table 2. Contamination Likert Rating Scale

1	2	3	4	5
Not at all contaminated	Slightly contaminated	Somewhat contaminated	Moderately contaminated	Extremely contaminated

Major Findings and Recommendations

Composting Behavior in the Dorm Cafeterias

In the course of 18 hours, 1372 individuals were observed. The majority of individuals exhibited desirable composting behavior, with exactly 75% (1029) composting all of their compostable materials. Of the individuals who displayed undesirable composting behavior: 39.9% (137) disposed their garbage in the compost bin; 39.4% (135) disposed their compost in the garbage bin; 7.9% (25) disposed their recycling in the compost bin; and 1.5% (5) disposed their compost in the recycling bin (Figure 1).

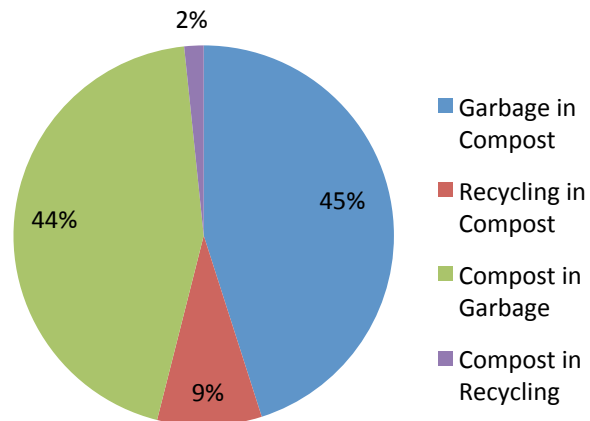
While the data supports that 75% of individuals engaged in desirable compostable behavior, it is likely this percent is overinflated. Two instances illustrated that some amount of individuals engaged in desirable composting behavior out of “luck” rather than from knowledge. The first case occurred when the two closest compost bins were removed. When this occurred, individuals became obviously confused and began throwing everything into the garbage container (the closest bin to the entrance). This indicates that individuals may typically throw items in the compost because of “habit” and convenience, rather than actually understanding what is compostable. These individuals are highly likely to compost undesirably when they have non-compostable items that they throw in the compost.

A second case occurred when a product vendor was passing out samples of their tea product in small compostable cups. These cups were not the typical cups used in the cafeterias and individuals were unsure of how to dispose of them. Some, composted them correctly, and when asked how they knew to do so they indicated that they either read the cup, which said it was compostable, or realized it was compostable by its feel. Other individuals did not read or consider the cup and immediately threw it in the garbage container. This indicates that some individuals lack knowledge on why things are compostable. This was further supported through interviews conducted. Individuals indicated that they assumed items were compostable if they felt biodegradable. However, other individuals only thought food waste was compostable; and in some instances, individuals thought only containers were compostable and that food waste was garbage. One of the largest contaminants in the compost is receipts. Individuals who threw their receipts away indicated that they knew receipts were not compostable because they felt “plastic” rather than made from natural materials.

Factors Influencing Desirable Composting Behavior

Of the eleven factors that might influence composting behavior, seven caused significant increases to the likelihood of an individual engaging in desired composting behavior (Table 1). The likelihood of individuals engaging in desired composting behavior was influenced by which **cafeteria** the individual was at. At Eleven 01, individuals were more likely to compost all of their compostable items. Reviewing

Figure 1. Undesired Composting Behavior



contamination data at both cafeterias supports this difference with greater than 99 non-compostable items found in the compost at The 8 compared to 65 at Eleven 01. However, the level of contamination, or amount of contamination, is relatively similar between the two cafeterias with The 8 scoring a 2.08 and Eleven 01 a 1.92. This can be interpreted to mean that both cafeterias on average have compost bins that are slightly contaminated. This is likely because the majority of non-compostable contaminants at The 8 were small items compared to items at Eleven 01.

As hypothesized, **students** engaged in desired composting behavior more than individuals who were not students (75.8% compared to 64.2%). Students who frequent the cafeterias said that they learned about composting through various signs around the cafeteria, and some indicated that they learned about composting from their parents as they grew up. Frequent exposure to the signs seemed to be a major influence on students who composted. Many students indicated they knew what was compostable because they had viewed the signs. However, in our observations very few individuals looked at the signs. Interview evidence indicated that signs were used heavily at the beginning of the academic year, but by spring quarter individuals had learned and did not need to refer to the signs.

There was no significant difference between **gender**, with 75.1% of females and 74.9% of males engaging in desired composting behavior.

Individuals who used **reusable ceramic plates** were more likely to engage in desired composting behavior (79.8%) compared to those using disposable plates (72.5%). This appears to occur because individuals with ceramic plates are less likely to have non-compostable items; therefore, they can scrape their compostable food scraps into one bin with little sorting and effort. Furthermore, they have to take the extra step of placing their plate on the dish return, increasing their commitment to waste disposal in the first place and making it not that much more difficult to spend a few extra seconds correctly disposing various waste items.

Surprisingly, individuals who **looked at current compost signage** did not engage in desired composting behavior more than those who did not look at the signs (72.3% compared to 75.1%). Overall, very few individuals observed actually looked at the signs (3.4%), and when interviewed individuals answered that they already knew what was compostable or they used to look at the signs earlier in the year.

While looking at signs above the compost did little to influence compost behavior, whether individuals could **see the compost from where they ate** had a strong influence on composting behavior. Individuals who could view the compost from their table engaged in desirable composting behavior 90.0% of the time compared to 74.5% for those who could not see compost from where they sat. This indicates that subconscious processing mechanisms may influence composting behavior. While individuals who view compost while they eat may not be actively thinking about compost, this visual trigger seems to be processed and influences their behavior once they go to dispose of their waste.

Social influence also had a strong influence on an individual's composting behavior. Social influence was recorded if the observed individual copied the behavior of someone they could see composting before them. Individuals with the prospect of social influence engaged in desired composting behavior 89.9% of the time compared to 72.2% of individuals with no social influence. This was also supported by our results of observing the **level of crowd** in the composting area and its affect on composting behavior. As level of crowd increased, the likelihood of engaging in desired composting behavior increased (contrary to our hypothesis), indicating that the more social people composting can create a social norm where individuals conform to a group's behavior.

An individual's **level of distraction**, as predicted, influenced composting behavior. The individuals with the greatest distraction engaged in desired composting behavior only 25.0% of the time compared to 75.0% of individuals with no distraction. However, an individual's **level of confusion** did not have a significant impact on composting behavior.

Table 1 – Influence on Desired Composting Behavior

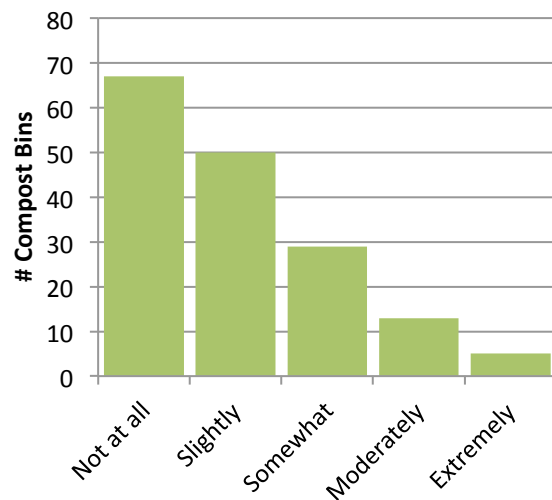
Measure	Chi-Square Value	P-Value	Influence on Desired Behavior
Cafeteria	34.207	0.000*	Higher at Eleven 01
Meal	25.147	0.000*	Higher at dinner
Gender	0.009	0.925	
Student	6.337	0.012*	Higher for students
Reusable Plate	8.924	0.003*	
Look at Sign	0.184	0.668	
See Compost from Table	4.944	0.026*	Higher if individual sees compost while eating
Social Influence	30.365	0.000*	
Level of Distraction	30.417	0.000*	Lower as distraction increases
Level of Crowd	15.397	0.009*	Higher as crowd increases
Level of Confusion	4.214	0.378	

Compost Contamination

In this stage of the study, 164 compost bins were weighed and given contamination ratings. For both cafeterias, the average contamination rating is 2.0183 or “slightly” contaminated (Figure 2).

Along with taking contamination ratings, contaminated items were recorded to get a general frequency of which items were most often occurring in the compost. The top five contaminants in order are: receipts (49), coffee cup sleeves (19), plastic wrappers (18), soup lids (15), and milk cartons (15). This breakdown is similar compared to the contaminants identified during composting behavior observations.

Figure 2 – Level of Contamination



Conclusions

After conducting this research, we recommend the following interventions to increase the desired use of compost. While these recommendations draw from this research, it is recommended that each should also be evaluated upon implementation to learn how effective they are at promoting desired composting behavior.

Compost Containers

There are three important considerations for compost containers: (1) labeling, (2) coloring, and (3) placement/arrangement. It is important that compost, recycling, and garbage containers are clearly labeled. From our observations, it became clear that most containers are not explicitly labeled, except

on their lids (which is not useful because individuals cannot see the lids when open). Signs above the container appear to be used in place of direct labels on bins, which may cause confusion about which container is which. At one cafeteria there is a waste “cabinet” that holds all the waste containers and does have labels; however, this cabinet may cause confusion because it reduces the ability for individuals to differentiate bins based on color.

Considering that individuals are constantly being exposed to written stimuli such as signs, color can play an important role in information processing. Having separate colors for each type of waste container is critical. In one instance, an individual was about to throw a plastic bottle in the garbage and at the last second they recycled the bottle instead. When asked what changed their mind, they indicated that it was seeing the blue container out of the corner of their eye. They associate blue with recycling and used this visual cue to correct their behavior. This indicates that while labeling is important, color association is perhaps more critical in individual behavior choices. So, while these waste “cabinets” may increase labeling effectiveness, the loss of color distinction among containers is worrisome.

The third component about containers is their placement/arrangement. Our observations made it clear that individuals who are not heavily motivated by environmental concern likely dispose of their waste in the easiest and most accessible container. Making the compost easy to access seems to have increased composting behavior, but it also leads to higher levels of contamination. It seems that another consideration is arrangement since our observations show that areas that had compost, recycling, and garbage containers in a row increased the likelihood of individuals engaging in desired composting behavior. This type of arrangement is a signal to individuals that not all waste is the same, and that there are various waste disposal mechanisms. When individuals are confronted by this fact, we predict that they are more likely to segregate their waste and reduce contamination.

Compost Signs

Compost signs are a major component of where individuals learn which items are compostable. Their influence is greatest at the beginning of the academic year when individuals are learning. Throughout the year, individuals become less dependent on the signs to direct their behavior and they eventually stop looking at them. Some of our interviews brought up issues with current signage being somewhat confusing and that the signs are too small. The majority of signs focus on education, showing which items are compostable. However, even with this, certain items are consistently disposed of incorrectly. This indicates that these signs may have too much information on them to be fully processed by individuals. Furthermore, current signs are only found above or near compost bins.

Our recommendation is to try and influence behavior earlier in the process of eating at the cafeteria. Having signs in areas where individuals are receiving compostable items that indicate whether they are compostable, recyclable, or garbage, may influence good behavior at an earlier stage. Identifying items that are consistently disposed of incorrectly, such as receipts, soup lids, and milk cartons; and highlighting them through signs may increase their correct disposal. There are multiple ways to structure these signs. We recommend testing out two strategies. The first is a prompt method that just says how to dispose of the item. For example, “Please recycle your milk carton.” The second strategy is to use social norms to influence behavior. This would require setting up a message that indicates the majority of individual’s dispose of an item in the correct way. For example, “Most people who eat in this cafeteria recycle their milk cartons.” Further observation can identify which of these strategies are most effective at changing and influencing behavior.

Major Influences on Composting Behavior

Our observations indicated that there were three factors that especially influenced the likelihood of individuals engaging in desired composting behavior: (1) social influence, (2) using ceramic plates, and (3) viewing compost bins/signs while eating. We recommend identifying ways to increase these factors in the cafeterias. In regards to social influence, there are possibilities of focusing on using social norms and influence in designing messaging (both on signs and videos). Working with staff and individuals to always use ceramic plates if they are eating in the cafeteria, or not offering takeout containers, are strategies to increase ceramic plate use. Lastly, placing signs in other areas and not just above compost containers or placing containers in views of eating areas may also be effective strategies.

Compostable Materials

During the observations, items incorrectly thrown into compost bins were tracked. Table 3 below displays compost contamination by item. It is recommended that the most frequently incorrectly composted items be addressed either through discouraging their use, or replacing with compostable options. Fifty-nine percent of incorrectly composted items were receipts. Many students are not aware that receipts are not compostable and are in fact toxic to compost due to the ink and paper used. This could be addressed by having the cash register clerks tell each student that receipts are not compostable as they hand out receipts. There could also be a sign posted on each register saying that receipts are not compostable. Other frequent incorrectly composted items include chip bags/wrappers (14%) and soup lids (11%). It is recommended that Housing and Food Services look into replacing these items with compostable items, or removing them from the cafeterias.

Table 3. Compost Contamination by Item

Garbage in Compost	Recycling in Compost	Compost in Garbage
Receipts (59%)	Milk cartons (41%)	Everything (25%)
Chip bags/wrappers (14%)	Other (18%)	Food waste (18%)
Soup lids (11%)	Newspapers (14%)	Napkins (18%)
Other (8%)	Yogurt cups (14%)	Cups (12%)
Plastic Wrap (7%)	Bottles (13%)	Other (10%)
Gloves (1%)		Plates (5%)
		Utensils (4%)
		Coffee cup lids (4%)
		Sushi trays and chopsticks (4%)

Final Recommendations

In summary of the above conclusions and recommendations, the following implementations are recommended to increase composting behavior in campus cafeterias:

- Clearly label each compost, recycling and garbage container, and more specifically, have separate colors for each container.
- Arrange compost, recycling, and garbage containers in a row to signal not all waste is the same and that there are various waste disposal mechanisms.
- Influence behavior earlier in the process of eating at the cafeteria by having signs in areas where individuals are receiving compostable items that indicate whether they are compostable, recyclable, or garbage.
- Work with staff and individuals to use ceramic plates if they are eating in the cafeteria, or not offering takeout containers are strategies to increase ceramic plate use.
- Decrease the use of non-compostable materials in cafeterias.
- Place signs in other areas and not just above compost containers, or place containers in views of eating areas.
- When using signs, use the following messaging strategies:
 - Prompt method that says how to dispose of the item. For example, “Please recycle your milk carton.”
 - Use social norms to influence behavior. For example, this would require setting up a message such as, “The majority of individuals in this cafeteria compost food scraps correctly.”

Appendix A

Table 4 shows the full chi-square results for the possible factors that significantly influence desired composting behavior.

Table 4. Influence on Desired Composting Behavior

Measure	% Exhibiting Desired Behavior	Chi-Square Value	P-Value
Cafeteria			
The 8	69.4%	34.207	0.000*
Eleven 01	83.3%		
Meal			
Breakfast	71.4%	25.147	0.000*
Lunch	71.3%		
Dinner	84.3%		
Gender			
Female	75.1%	0.009	0.925
Male	74.9%		
Student	75.8%	6.337	0.012*
Reusable Plate	79.8%	8.924	0.003*
Looked at Sign	72.3%	0.184	0.668
See Compost from Table	90.0%	4.944	0.026
Social Influence	89.9%	30.365	0.000*
Level of Distraction			
Not at all	75.0%	30.417	0.000*
Slightly	70.2%		
Somewhat	25.0%		
Moderately	85.7%		
Extremely	25.0%		
Level of Crowd			
Not at all	72.4%	15.397	0.009*
Slightly	77.4%		
Somewhat	82.8%		
Moderately	78.1%		
Extremely	82.5%		
Level of Confusion			
Not at all	75.2%	4.214	0.378
Slightly	70.4%		
Somewhat	79.2%		
Moderately	62.5%		
Extremely	00.0%		