

The Effect of Human Advertising on the Composting Rate at UC-Berkeley Restaurants**Mark Looman**

Abstract Two restaurants on the UC-Berkeley campus with a composting program were studied to measure the effects of poster vs. human advertising. At both restaurants, informational posters about composting were in place, but at one restaurant, a volunteer also informed customers about composting. Surveys were conducted at the same time to record the consumer demographics data and their knowledge of composting and behavior. Human advertising was not found to be more effective at getting people to compost than the informational posters. The study found that frequency of attendance at a restaurant was correlated with how likely one was to compost, but this relationship was positive at one restaurant and negative at the other. At one restaurant, students in environmental majors and older consumers were also more likely to compost.

Introduction:

Although recycling has entered the public conscience as a responsible act in the past few decades, composting – the active process of converting organic materials back into soil – is not very widespread, but may be as important for waste reduction. Consider, for example, the fate of food and other products typically thrown in the trash after a meal (e.g. pizza crusts, chicken bones, napkins, and cardboard pizza boxes). Though these materials cannot be recycled, they can all be composted (EPA 2006). Along with yard waste, food waste makes up 24 percent of the solid waste stream in the United States, taking up precious space in a landfill and possibly contributing to groundwater and soil pollution (EPA 2006). If this waste was instead composted, it would create nutrient-rich soil through decomposition of the organic material which may reduce the need for chemical fertilizers and even promote plant resistance to pests and diseases (EPA 2006). Composting may also clean up pollutants in the soil and air by binding to or degrading contaminants and it can also act as a landfill cover (EPA 2006), but its main benefit may be that it diverts waste from landfills.

For composting to provide a significant alternative to landfills, the resulting soil needs to be used, whether as a landfill cover or by gardeners and farmers. Information and quality standards about composted soil need to be readily available to support the use of compost by growers (Rahmani 2004). Composted soil may reduce the need for irrigation, chemical fertilizers and pesticides while increasing the yield and quality of the crop, but there is a significant investment to purchase, transport, and apply compost to fields (Rahmani 1999). In a cost-benefit analysis for growers in Florida, tomato growers had a \$65/acre benefit by using compost while citrus growers could see a substantial \$526/acre benefit (Rahmani 1999), demonstrating the potential market for compost in agriculture.

The University of California-Berkeley already has a well-established waste management program on campus run by the Campus Recycling and Refuse Services (CRRS). Five to seven tons of mixed paper are recycled a day, over two tons of glass, aluminum, and plastic containers are recycled a week, and 18-25 tons of yard waste is composted a week (CRRS 2007). CRRS also collaborates with Cal Dining, which oversees the university's dining halls and campus restaurants, on their waste management. Currently, pre-consumer composting – the composting of organic waste produced in the preparation of food products – occurs in the kitchens of the four dining halls run by Cal Dining. This results in about two tons of waste each week (L. Bauer,

pers. comm.). However, post-consumer composting, where the consumers compost their leftovers from a meal, has not been fully implemented at the university. This represents the last large area of recycling that needs to be put into place at UC-Berkeley.

Recently, Cal Dining has made it a goal to bring post-consumer composting to their facilities. In the fall of 2006, Crossroads, the largest dining hall, made post-consumer composting an option for customers (Cal Dining 2007). Additionally, Cal Dining stopped using Styrofoam to make their to-go boxes and now use bagasse, a compostable material made from the leftover canes used in processing sugarcane. They have coffee cups and utensils made from compostable materials as well (Cal Dining 2007). There are four sites at the Unit One residential hall where these to-go boxes as well as old pizza boxes can be disposed of and then transported to a composting facility (Cal Dining 2007). Now there is a program at the Golden Bear Cafe (GBC) and Pat Brown's Grill coordinated by CRRS and Cal Dining to collect post-consumer food and paper waste and have it composted. Compost bins will be set up at these two restaurants along with posters alerting the customers that they can dispose of their food waste and other items, such as napkins, to-go boxes, and coffee cups, into these bins. For this program to be effective, like any other waste disposal or recycling program, consumers must be aware of the program, willing to dispose of their food and organic waste into the bins, and it must be relatively easy to perform. Also, how the program is advertised to the students may influence efficacy.

The success of the composting program depends on people's knowledge of and willingness to participate. In a study of Swiss adults, researchers found that both the knowledge of what actions can be taken to help environmental problems and the knowledge of their effectiveness are closely associated with people taking these actions (Frick 2004). Although the study was done with Swiss subjects, the results can be applied to Americans as well. The results make sense intuitively since people are unlikely to behave in a desired way if they lack the knowledge of how or why they should act to help the situation. If the customers at these restaurants know that putting their food waste in the compost bins helps the environment by diverting waste from landfills, they may be more likely to participate than if they had no understanding of the many environmental and economic benefits of composting. However, another study of adults shows that environmental knowledge is not as important in predicting environmentally-friendly behavior as are previous experiences with the environment, like environmental activism, experiences in nature, or witnessing of environmental catastrophes

(Finger 1994). This indicates that for some people there may be a gap between their knowledge of the appropriate behavior for environmental issues and their actual behaviors.

Along with knowledge of the environment, people's attitudes towards environmental issues vary and it might be hard to find one technique to get everyone to compost. In a study of university students and their recycling behaviors, males are more likely to recycle regardless of the situation if they have a history of recycling, while females tend to recycle according to how standard or socially expected it is in certain situations (Goldenhar 1993). Based on that reasoning, it might be easier to convince females to compost their waste at the campus restaurants, while males are more likely to compost or not based on their previous recycling behaviors or attitudes. College students in different disciplines have been shown to have varying attitudes about the environment (Ewert 2001). In a national study, people who had majored in business or economics were less likely to recycle than people who majored in other fields (Smith 1995). Students in environmental studies have been found to care more about and participate in more pro-environmental activities than business majors (Wysor 1983). This could be because environmentally-conscious people choose to pursue environmental studies, the courses these students take expose them to the importance of environmental issues, or some aspect of business and economics courses – or the students who take them – discourages collective environmental action. Other demographic differences, such as education, income, and ethnicity, have been shown to be correlated with different environmental outlooks as well (Smith 1995). These differences may mean that different educational approaches need to be taken for different groups. However, the hope is that composting will be so easy and the students will be informed about it enough that they will be inspired to actually do it.

Many studies have been done observing people's recycling and waste disposal behaviors. It has been found that for composting, "intention [is] positively influenced by attitude, subjective norm, and perceived behavioral control. Attitude toward composting [is] positively influenced by relative advantage and negatively influenced by complexity" (Taylor 1995). This suggests that if composting is accessible, relatively simple to do, and there is some sense of obligation to do it, people will compost. In fact, it has been found that when it comes to a solid-waste recycling program, which is similar to post-consumer composting, the most important determinant of its success is how easy it is to participate. Hence, the implementation of the program and its management is paramount (Folz 1991). In a study conducted on a college

campus, it was found that trying to change people's attitudes about their littering was not as effective as making it easier to dispose of their waste (Liu 2004). This shows that desired waste disposal behavior for college students is more readily brought about when the action is easy for them to perform. If the bins at the campus restaurants are in a prominent position and consumers are informed on what can be put in them, then it should hopefully mean that students will be willing to compost.

The way the composting program is advertised at these restaurants will also affect the composting rates. There have been studies that looked at the differences in persuasiveness of various modes of giving the same information. Researchers studying college psychology students found that delivering easy messages face-to-face was more persuasive than in the written form (Chaiken 1976). Since informing consumers what can and cannot be composted is not extraordinarily complex, it might be that having someone speak this information to consumers might be more effective than having it solely written on the posters. Another study found that the presence of the source of information may make them seem more credible, and thus more persuasive (Whittaker 1967). A researcher analyzing this effect of increased persuasiveness has given many possible reasons for why it might exist: the receiver might feel like their opinion matters more, he does not want to oppose the person delivering the message, the receiver might identify with the person delivering the message, or there might be some verbal and non-verbal cues that affect the receivers behavior (Lee 1986). For whatever reason, the composting program might be more successful if people rather than posters advertise the option to consumers.

As previously mentioned, Cal Dining is planning to bring post-consumer composting to their restaurants on the Berkeley campus and will start by introducing it at the Golden Bear Cafe and Pat Brown's Grill. Although issues like the correlation between knowledge and behavior (Frick 2004; Finger 1994) and attitudes and behavior (Liu 2004; Taylor 1995) have been discussed, and the effect of personal vs. non-personal message persuasiveness was looked at as well (Whittaker 1967; Chaikern 1976; Lee 1986), none of the previous studies looked at whether advertising a certain waste disposal behavior is more effective when accompanied with a person delivering the information. Will more people put their waste in compost bins if an agent, rather than just a poster, informs them that they can?

The goal of the study was to test whether information, in the form of posters listing what can and cannot be composted, presented with a person advertising the composting option as well is more effective in increasing the composting rate than with just the poster alone. It was hypothesized that the restaurant with the information and the human interaction will be more effective in increasing the composting rate than the restaurant with just the information. It was also predicted that students will compost more often than employees, students in environmental majors will compost more than their counterparts, and those who go to the restaurants frequently will compost more than those who go rarely, since they would have greater exposure to the program.

The results of this study could be of use for Cal Dining when they eventually expand the program to their remaining restaurants on campus, because if there is no real difference between the composting rates at the two restaurants then it would be cheaper and easier for them to just present the information by itself. Alternatively, if the information is much more effective with someone communicating its message to the target audience, than Cal Dining may find it worthwhile to hire people in future outreach programs or to attract volunteers from campus groups to do the work for them. The results may also be of use to organizations on campus looking to promote some new program or cause in the future, especially if these groups are concerned with environmental issues.

Methods:

The study was conducted at two on-campus restaurants, the Golden Bear Cafe (GBC) on Upper Sproul Plaza and Pat Brown's Grill, which is located by the Genetics and Plant Biology Building. Each restaurant was studied ten times, starting on February 14th and ending on April 15th (Appendix C). After five studies at each restaurant when only informational posters were used, the human advertising began at the Golden Bear Cafe. Pat Brown's Grill did not have any human advertising and served as the control. The materials necessary for this project included informational posters (Appendix F) provided by Cal Dining, which list what can and cannot be composted, and surveys. Two volunteers assisted in the administering surveys and acting as the human source of information at the Golden Bear Cafe.

The surveys were slightly altered after February 22nd to yield better information. The new survey (Appendix A) added a question asking the subject to describe materials that could be composted. The subjects who composted were also asked how they were made aware of the

composting option at the restaurant. The question on the old survey (Appendix B) about the importance of composting was changed into a ranking relative to recycling. Finally, the order was slightly altered. The questions relating to whether the subject composted were moved to the end of the survey. Most of the information remained the same, so data from the old surveys were still used in analysis.

There is literature that finds that live interaction is more persuasive than written information (Chaiken 1976, Whittaker 1967, Lee 1986), so the hypothesis is that the restaurant that uses posters plus the person should have a higher composting rate than the restaurant with only the posters. During peak hours, surveys were administered at the exit of one of the restaurants for an hour. The time of the experiment was always the same, from 12 PM to 1 PM. The time period was chosen according to times when each restaurant has large volumes of sales. Analyzing composting rates for identical times of the day lessened the chance that different types of consumers were compared, e.g. early morning breakfast eaters and mid-afternoon snackers. When handing out the survey, every other person was approached to decrease selection bias and both volunteers were female, so sex bias was minimized as well. At the GBC, only information that was available from the poster was recited by the volunteer, so better information was not a factor in any increase in the composting rate.

Both quantitative and qualitative data were measured in this study. The quantitative data included the composting rates measured over the course of the study at each restaurant as well as some of the responses to the survey, to which numerical values could be affixed. The qualitative data were survey responses which needed to be analyzed in a different manner, like those that deal with why the subject did or did not compost. The study was conducted up to four days a week for an hour each day, from February 14th to April 15th. For the first two weeks, only the posters were set up at both restaurants, but after March 4th, a volunteer began to inform customers that composting was available at the GBC. The composting rate was obtained by measuring the volume of waste composted over the hour and dividing it by the number of people purchasing food over the same hour. Volume of waste was used as opposed to weight because the company that hauls the waste bills the university for volume, not weight. The difficulty in weighing the waste was also a factor. All composted waste was disposed of into 64- and 32-gallon bins, so the waste volume was assessed by measuring the change in height of the waste in the bins from the start of the experiment to the end and then multiplying by the cross-sectional

area. Cal Dining keeps records of the amount of sales in fifteen minute blocks, so this yielded the number of consumers over the experimental time period. The composting rates were important data for my study, since one of the goals of the study was to find whether there was a significant effect on the composting rate as a result of the human source of information.

The same survey instrument was used at both the Golden Bear Cafe and Pat Brown's Grill (Appendix A,B). As previously mentioned, the survey was slightly altered based on early responses. The surveys are divided into three parts: the first section measures the demographic characteristics of the respondents; the second section measures the behavior of the respondents; and the third section measures the knowledge and attitudes of the respondents. The demographic characteristics include age, gender, student status¹ and major, professional status and employer (if UC-Berkeley), and whether the respondent used a Cal Dining card or cash. These factors are important since the population that visits each restaurant is not identical and, according to Cal Dining management, the ratio of staff-to-students is higher at Pat Brown's than at the GBC, so that needs to be included as a possible means of stratification in the results.

The behavioral section focuses on the subject's consumption behavior, restaurant attendance, and waste disposal behavior. Questions 3 and 4 in the survey (Appendix A) measure consumption behavior. They ask whether the subject purchased food or beverage at the restaurant or brought their own, as well as what was purchased. A follow-up question for those who purchased something at either restaurant is whether they consumed it at the restaurant. The number of respondents who purchase items and do not eat at the restaurant affects the composting rate. It increases the volume of sales but are not around the restaurant to compost.

Questions 5 and 6 (Appendix A) try to quantify the restaurant attendance of the subject. Since the population that goes to Pat Brown's is able to eat at the GBC and vice-versa, this is a realistic issue for the study. The more often the subject frequents one restaurant, the more likely they are to be exposed to the informational materials at that restaurant. The options available measure the relative frequency with which the respondent attends either restaurant. There are four degrees of attendance for the restaurant where the survey is being take, ranging from rarely

¹ If the subject was a student, the subject was not considered to be a UC employee even if employed by UC-Berkeley. This made these categories mutually exclusive so that the composting behaviors of the two groups could be compared.

to highly frequently, and five degrees of attendance for the other restaurant, ranging from never to highly frequently².

Questions 7, 8, and 9 (Appendix A) measure knowledge and attitudes of the consumers about composting. If people responded affirmatively regarding awareness of the composting program, I wanted to know if it was because of the information at the restaurants or because the subject already knew about composting and would have composted regardless of the intervention or the way the information was presented. Questions 8 and 9 measure the attitude of the subject towards composting, which enabled correlations between attitudes towards composting and behavior as well as the attitudes of certain demographics.

The last two questions (Appendix A) ask about the subject's waste disposal behavior. Follow-up questions for those who composted are what they composted and how they knew to compost. What was composted can be compared to what was bought or eaten from questions 3 and 4 to see if consumers are more or less aware of the compostability of certain objects. Asking how they knew to compost will give some measure of how effective the presentation of information is or if people are composting because their peers are doing it or for some other reason. For those who did not compost, I want to see if it is because of ignorance about composting or a choice not to compost and I will group the responses into those two categories.

The composting rates at the two restaurants were measured each time there was a study (Appendix D). A two-tailed t-test was run to analyze the rates at the GBC and Pat Brown's before the volunteers were used. This tested for pre-existing differences between the two restaurants. A one-tailed t-test was run to analyze the composting rates at the GBC before and after the volunteer was added. A one-tailed test was used because it was thought to be unlikely that the personal source of information would have a negative effect on the composting rate. The hypothesis is that this test would show a significant increase in the composting rate after the volunteer was used. A two-tailed t-test was run to analyze the composting rates at Pat Brown's Grill for the same periods. A two-tailed t-test was used because it was unclear how the composting rate would change over time. The hypothesis was that no significant difference in the composting rate would be found. The threshold for significance for these statistics and all others was set at $p < 0.10$.

² The option of "never" is not included at the restaurant at which the survey is being administered because the respondent has obviously been there at least once and the availability of that option may lead to false answers.

Logistic regression was used to measure the effect certain independent variables – specifically age, gender, major, student or employee status, and how often the subject ate at the restaurant – had on the composting rate at each restaurant. Since many of the subjects only bought food at the restaurant but ate elsewhere, the independent variables were adjusted by removing the respondents who did not either eat their purchased food at the restaurant or bring something to eat to the restaurant. Both the unadjusted and adjusted values are shown.

Previous studies found that business and economics majors tend to recycle less than all other majors (Smith 1995), so that was one model for analyzing the effect a student's major has on the probability of composting. Students majoring in business or economics were put in one group and all other students were put into the other, then their reported composting behavior was analyzed. Other studies found that students in environmental studies majors are more likely to engage in environmental activities (Wysor 1983; Ewert 2001). The other model of analysis put students with environmental majors into one group and all other students into the other.

The logistic regression yielded an odds ratio and a chi-squared value. The odds ratio says how much the probability of composting increases when the value of the independent variable increases by 1 unit³. The chi-squared value gives a goodness-of-fit, or in this case, how well it matches with the logistic curve.

Results:

A total of 336 surveys were collected, 182 from the Golden Bear Cafe and 154 from Pat Brown's Grill.

At the Golden Bear Cafe, there was a relationship between how frequently subjects ate at the restaurant and whether they composted (Chi= 4.0, p= 0.047; Chi (adj.)= 3.0, p= 0.086) (Appendix D). The more often the subject attended the restaurant, the less they tended to compost (O.R.= 0.63, p= 0.036; O.R.(adj.)= 0.63, p= 0.085). Other variables (gender, age, importance of composting ranking, and business/economics vs. other majors) were not found to be related to composting behavior (Appendix D). An odds ratio for students vs. employees was not possible because there were very few UC-Berkeley employees surveyed at the restaurant (three employees out of 162 total people surveyed) and none composted. An odds ratio for environmental majors vs. non-environmental majors was also not possible because very few

³ For gender: male= 0, female= 1; for student-employee comparison: student= 0, employee= 1; for business/econ analysis: business/economics= 0, all other majors= 1; for environmental analysis: non-environmental majors= 0, environmental majors= 1

students with environmental majors were surveyed (only ten out of 134 students with declared or intended majors) and none composted.

At Pat Brown's, like at the Golden Bear Cafe, there was a relationship between frequency of attendance and composting ($\text{Chi}(\text{adj.})= 4.0, p= 0.044$) (Appendix D). However, unlike the GBC, subjects were more likely to compost if they went to the restaurant more often ($\text{O.R.}(\text{adj.})= 1.9, p= 0.081$). Age was also found to be correlated with composting ($\text{Chi}(\text{adj.})= 2.9, p= 0.091$) and older customers were more likely to compost ($\text{O.R.}(\text{adj.})= 1.8, p= 0.081$) (Appendix D). Dividing the student population into environmental and non-environmental majors was a good predictor of composting behavior ($\text{Chi}= 3.7, p= 0.054; \text{Chi}(\text{adj.})= 2.9, p= 0.088$) (Appendix D). The students in environmental majors were three times more likely to compost than students in other majors ($\text{O.R.}= 3.0, p= 0.049; \text{O.R.}(\text{adj.})= 3.2, p= 0.079$). None of the other variables (gender, importance of composting ranking, student vs. employee, and business/economics vs. other majors) were found to have an effect on composting. An odds ratio was not possible for the business/economics majors vs. other majors because no business or economics majors (only six out of the 114 students with declared or intended majors surveyed) composted.

When both restaurants only had informational posters, the composting rates were not significantly different ($t\text{-stat}= -0.081, p\text{ two-tail}= 0.94, df= 8$) (Appendix E). Since there was not a pre-existing difference between the two restaurants, t-tests were done to analyze the composting rates at each restaurant before and after the human advertising was added at the Golden Bear Cafe (Appendix E).

Pat Brown's – which only had the informational posters for both periods – experienced a drop in the composting rate during the second half of the study (Fig. 1), but the change was not found to be significant ($t\text{-stat}= 1.2, p\text{ two-tail}= 0.25, df= 8$). The slight change in the composting rate at the Golden Bear Cafe after the volunteers began to inform customers about the composting program (Fig. 1) was not significant, either ($t\text{-stat}= -0.44, p\text{ one-tail}= 0.34, df= 8$).

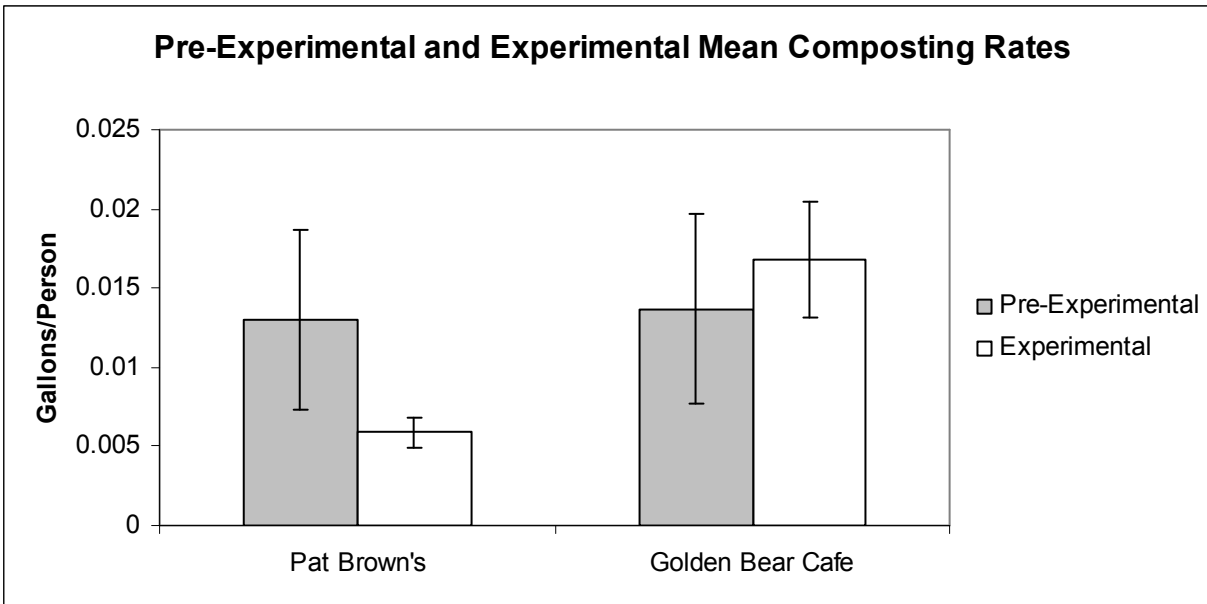


Figure 1: The average composting rates at Pat Brown's and the GBC with their standard error before and after the human advertising was used at the Golden Bear Cafe.

Discussion:

The key result of the study was that advertising the composting program with human volunteers was not found to be more effective than the informational posters. While the GBC experienced only a mild yet insignificant increase in the composting rate, Pat Brown's, which served as the control, saw the composting rate drop over the same time period. The hypothesis that there would be a significant increase in the composting rate at the Golden Bear Cafe after the human advertising was added was not supported.

It is possible that informational posters are as effective at advertising the composting program as people are. The most common way that people were made aware of the composting option was by noticing some combination of the signs and green bins, which Cal Dining uses at other dining facilities for composting. At the GBC, only six people reported that they were made aware of composting from the volunteer. Composting may be complex enough that unless a person knows something about composting beforehand, the limited information received from the volunteer was not enough to influence that person into composting. A potential confounding factor is that only 27% of the people surveyed ate at the restaurant, so many customers probably may not have paid much attention to what the volunteer was saying about composting since they

would not be at the restaurant to compost anyways. Many of these customers may also be in a hurry to get somewhere, so they may tune out the volunteer.

The decrease in the composting rate at Pat Brown's, though not significant, raises an interesting possibility that may have disguised the actual effect at the GBC. My study ran from mid-February to mid-April and the weather became nicer as the study progressed. Customers may have been more inclined to buy food at the restaurants and eat elsewhere later in the spring, which would increase the volume of sales but these people wouldn't be at the restaurant to compost. At the GBC, 30% of the customers ate at the restaurant when only the posters were used, while only 23% of the customers ate at the restaurant when the volunteer was used. At Pat Brown's though, 52% of the customers ate at the restaurant for the first half and 60% of the customers ate at the restaurant for the second half. Part of this may have had to do with where the surveys were administered. Pat Brown's has two exits, a front and back, and the back exit was ignored during the second half of the study because it did not yield as many surveys as the front exit. More customers may buy their food and leave out the back exit than the front exit though. Future research could take place over a longer period of time to take into account seasonal effects on the composting behavior.

The decrease in the composting rate at Pat Brown's could also be due to outliers. The composting rate fluctuated much more during the first half of the study compared to the second half. It is possible that one or a few people composted a significant amount on a couple of occasions, or that someone from the kitchen dumped food waste in the compost bin at some point during the first half of the study. This would make the composting rate appear to be higher than it actually is and would make it look like there was a decrease.

Another confounding factor is that the studies occurred on the same day of the week more often in the second half of the study than the first half. The original intention was to survey four times a week, twice at each restaurant. One restaurant would be surveyed Monday and Thursday, and the other would be surveyed Tuesday and Friday. The next week, the days would switch. This was complicated because of trying to coordinate the surveys with the volunteers' schedules, especially during the second half of the study, when a volunteer was absolutely necessary at the GBC. As a result, the study occurred on Tuesday four out of five times at the GBC during the second half while the days were varied during the first half (Appendix C). At Pat Brown's, three out of five times Thursday was the day of study during the second week,

while it was varied the first half (Appendix C). These days were overrepresented in my study. This troubles the results because class schedules are different on Tuesdays and Thursdays compared to Mondays, Wednesdays, and Fridays, so the lunchtime schedules and the crowds can be quite different. Certain classes may let out near the restaurants or people may go to the restaurant regularly on the Tuesdays and Thursdays which were overrepresented and would bias the survey population and composting rate. This could have made it look like there was not an increase in the composting rate at the GBC after the volunteer was added, when it was really due to a flaw in the study design. Further studies should take this into account and study all days of the week equally.

A key trend found using the surveys were that how often a person attends one of the restaurants is highly correlated with how likely that person is to compost. However, the frequency of attendance at a restaurant yielded mixed results. At Pat Brown's, the more frequently a person attends the restaurant, the more likely they are to compost their waste. At the GBC, the more often a person goes to the restaurant, the less likely they are to compost. Additionally, at Pat Brown's, older customers and students with environmental majors had a higher rate of composting than their counterparts. Gender, student status, and how the subject ranked the importance of composting in comparison to recycling did not show any relation to how likely the subject would be to compost. Students did not report higher composting rates than employees and there was not enough evidence to support the claim that business and economics majors compost less than other majors.

Although one study had found females more likely to recycle than males if it was a socially expected action (Goldenhar 1993), gender played no role in whether the subject composted or not. A possible explanation for this is that composting is new to both restaurants on campus and thus is not a behavior that is expected of consumers. In fact, in my surveys, a majority of subjects were unaware that composting was even an option. When asked what would make them more likely to compost, several subjects responded that they would begin to compost since they were aware of it or that they would compost if they knew it was beneficial for the environment. Once composting is more widely recognized as an environmentally responsible action at campus restaurants, maybe then a study would find that females were more likely to compost.

Age was also somewhat correlated with composting, although it trends in the opposite direction than I hypothesized. The older the person is, the more likely they are to compost.

However, the large difference between the adjusted and unadjusted values for age at Pat Brown's (Appendix D) suggests that there is something else going on. Some of this may be due to the low numbers of older people I had in my study. Only one person surveyed was older than fifty-five at the Golden Bear Cafe and about 90% of the population there was between the ages of eighteen and twenty-two. Since the number of people in each age range is not close to being equal, this may have significantly skewed my results.

Students in majors that have an environmental focus were more likely to compost at Pat Brown's. This might be because they are knowledgeable about composting or because they are consciously looking for the option at restaurants. This upholds the hypothesis I had that students with environmental majors would be more likely to compost, which was based on studies that found that students with environmental degrees were more likely to participate in environmental activities than those pursuing non-environmental degrees (Wysor 1983). However, the model that suggests business and economics majors would compost less (Smith 1995) than other majors was not found to be significant, although business and economics majors did not compost in the adjusted values (Appendix D).

Convenience seems to be another factor in composting. Many subjects have said that more bins or bins located next to trash cans would make them more likely to compost, but at each restaurant there are typically only two bins. The idea that convenience may be the chief factor in getting people to perform desired behaviors has been covered in studies (Taylor 1995; Liu 2004). How the study would have been different if there had been double the amount of bins or even bins inside the restaurants as opposed to outside is something to consider for future research. Cal Dining may want to purchase more composting bins or remove some trash cans so it is not more convenient to just throw all one's waste into the trash.

The most puzzling aspect of the results is why the frequency of attendance seems to be negatively correlated with the probability of composting at the Golden Bear Cafe. However, 74% of the subjects went more than once a week and another 13% went once a week, so about 90% of people who go to the GBC go very frequently. It is also very common for people to buy their food and then eat elsewhere, but even the adjusted value is significant. Freshmen are the majority of the consumers at the GBC since they have meal plans and may compost less than older students, although no significance was found from the surveys. At Pat Brown's, the

median student is a junior and the mode was senior, so the population is older and thus may be more likely to compost.

Future research could address many issues that came up with this project. The signs are not capturing the consumers' attention as much as I would have hoped, and in the future, signs that are larger and much more visually based would probably be more effective. Also, signs indicating where the bins are located would also be important for future research. Many subjects were unaware that composting was an option and did not notice either the signs or the bins. Future research could look at the difference in effectiveness between largely visual signs and written signs or at locations where the bins are clearly marked and one where the bins are not clearly marked. Some interesting research could be done in the disconnect between people's stated belief in the importance of and intention to compost and their actual composting behavior, since over 90% of the subjects have stated that composting is at least as important as recycling and they claim they will do it in the future, but less than 10% of them compost. Some of that has to do with unawareness of the composting option at the restaurants, but there is a potential for further research in this area.

This project can be potentially beneficial to Cal Dining or other university programs with a desire to alter behavior. This project found that signs were as effective as people at getting a message across, and it is cheaper to put up several signs than to pay people to put out the same message. If the sign is well-designed and catches the attention of the intended targets, then it could definitely affect behavior. People are also somewhat limited, as they can only talk to a few people at a time to get the message across, while signs can express their message to a lot of people at once. However, Cal Dining may have an interest in an extended study to see if people are actually more effective at changing behavior and it was not picked up in this study. They may just decide, though, that it is more cost effective to advertise with signs.

Although human advertising was not found to be more effective than informational posters, the project has been somewhat successful. At each restaurant there are people who have been waiting for composting to be an option and each day that surveys were administered there has been at least a little composting occurring. The hope is that after some time and with some better publicity, composting will become as common as recycling at restaurants across campus.

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Appendix A:

Sex: M / F Age: 18-22 23-29 30-39 40-54 55+

1. Are you a student? Yes / No

Year: 1 2 3 4 5+ Grad

What is your academic focus or major? _____

2. Are you employed by or work at UC-Berkeley? Yes / No

What is your profession? (Be specific) _____

3. Did you just buy food or drink at Pat Brown's Grill? Yes / No

If yes, what did you buy? _____

Did you use cash or meal points? _____

If you bought food or drink, did you consume it here? Yes / No

4. Did you consume any food or drink from outside at Pat Brown's? Yes / No

If yes, what did you bring? _____

5. How often do you go to Pat Brown's?

Once a month or less 2 or 3 times a month Once a week More than once a week

6. How often do you go to the Golden Bear Cafe?

Never Once a month or less 2 or 3 times a month Once a week More than once a week

7. Do you know what can and can't be composted? Yes / No

Please describe what can be composted _____

How did you learn about composting? _____

8. Do you think composting is more, less, or as important as recycling? More / Less / As

9. Do you intend to compost in the future? Yes / No

10. Did you compost any of your waste at Pat Brown's today? Yes / No

What did you compost? _____

How did you know you could compost here? _____

11. Is there any reason you didn't compost? _____

Were you aware that composting was an option at Pat Brown's? Yes / No

If yes, how did you know composting was an option? _____

What would make you more likely to compost? _____

Appendix B:

Sex: M / F Age: 18-22 23-29 30-39 40-54 55+

1. Are you a student? Yes / No

Year: 1 2 3 4 5+ Grad

What is your academic focus or major? _____

2. Are you employed by or work at UC-Berkeley? Yes / No

What is your profession? (Be specific) _____

3. Did you buy food or drink at Pat Brown's Grill? Yes / No

If yes, what did you buy? _____

Did you use cash or meal points? _____

If you bought food or drink, did you consume it here? Yes / No

4. Did you bring food or drink to Pat Brown's? Yes / No

If yes, what did you bring? _____

If you answered "No" to both questions 3 and 4, you are done with the survey. If you answered "Yes" to either of those questions, continue on to question 5.

5. How often do you go to Pat Brown's?

Once a month or less 2 or 3 times a month Once a week More than once a week

6. How often do you go to the Golden Bear Cafe?

Never Once a month or less 2 or 3 times a month Once a week More than once a week

7. Did you compost any of your waste at Pat Brown's today? Yes / No (If "No", skip to question 8)

What did you compost? _____

How did you know you could compost? _____

(Skip to question 9)

8. Why didn't you compost? _____

Were you aware that composting was an option at Pat Brown's? Yes / No

9. Do you know what can and can't be composted? Yes / No

How did you learn what can be composted? _____

10. Do you think it is important for people to compost? Yes / No

11. Do you intend to compost in the future? Yes / No

Appendix C:

Dates of study at the Golden Bear Cafe, pre-experimental: Thu. Feb. 14, 2008; Tue. Feb. 19, 2008; Fri. Feb. 22, 2008; Mon. Feb. 25, 2008; Thu. Feb. 28, 2008

Dates of study at the Golden Bear Cafe, experimental: Tue. Mar. 4, 2008; Tue. Mar. 11, 2008; Mon. Mar. 17, 2008; Tue. Apr. 1, 2008; Tue. Apr. 15

Dates of study at Pat Brown's Grill, pre-experimental: Fri. Feb. 15, 2008; Thu. Feb. 21, 2008; Tue. Feb. 26, 2008; Fri. Feb. 29, 2008; Mon. Mar. 3, 2008

Dates of study at Pat Brown's Grill, experimental: Thu. Mar. 6, 2008; Thu. Mar. 13, 2008; Tue. Mar. 18, 2008; Mon. Mar. 31, 2008; Thu. Apr. 3, 2008

Appendix D:

Table 1: Composting Rates at Pat Brown's and the Golden Bear Cafe. All values are in gallons per person.

Pat Brown's (Pre-Experimental)	GBC (Pre-experimental)	Pat Brown's	GBC
0.016	0.034	0.0056	0.011
0.003	0.02	0.0084	0.022
0.032	0.005	0.0027	0.0068
0	0.0086	0.0068	0.027
0.014	0.00076	0.0061	0.017

Table 2: Logistic regression of independent variables from survey with their effect on composting at the Golden Bear Cafe. Independent variables were also adjusted to include only those subjects who ate at the restaurant. Odds ratio and goodness-of-fit are given, as well as their p-values. The "*" symbol indicates significance, with $p < 0.1$ as the threshold.

<i>Golden Bear Cafe</i>	Sex	Sex, Adjusted	Age	Age, Adjusted	*	*
					Frequency	Frequency, Adjusted
Odds Ratio	1.7	1.4	1.3	1.7	0.63	0.63
p-value	0.39	0.62	0.40	0.19	0.036	0.085
Chi-squared	0.79	0.25	0.63	1.7	4.0	3.0
p-value	0.38	0.61	0.43	0.20	0.047	0.086

Table 3: Logistic regression of independent variables from survey with their effect on composting at Pat Brown's Grill. Independent variables were also adjusted to include only those subjects who ate at the restaurant. Odds ratio and goodness-of-fit are given, as well as their p-values. The "*" symbol indicates significance, with $p < 0.1$ as the threshold.

<i>Pat Brown's</i>	Sex	Sex, Adjusted	Age	* Age, Adjusted	Frequency	* Frequency, Adjusted
Odds Ratio	0.58	0.77	1.0	1.8	1.6	1.9
p-value	0.32	0.65	0.92	0.081	0.15	0.081
Chi-squared	1.0	0.21	0.0091	2.9	2.5	4.0
p-value	0.31	0.65	0.92	0.091	0.11	0.044

Table 4: Logistic regression of independent variables from survey with their effect on composting at the Golden Bear Cafe. Independent variables were also adjusted to include only those subjects who ate at the restaurant. Odds ratio and goodness-of-fit are given, as well as their p-values. The "*" symbol indicates significance, with $p < 0.1$ as the threshold.

<i>Golden Bear Cafe</i>	Student vs. Employee	Importance	Importance, Adjusted
Odds Ratio	Does Not Work	2.1	2.6
p-value	Does Not Work	0.37	0.31
Chi-Squared	Does Not Work	0.81	1.1
p-value	Does Not Work	0.37	0.30

Table 5: Logistic regression of independent variables from survey with their effect on composting at Pat Brown's Grill. Independent variables were also adjusted to include only those subjects who ate at the restaurant. Odds ratio and goodness-of-fit are given, as well as their p-values. The "*" symbol indicates significance, with $p < 0.1$ as the threshold.

<i>Pat Brown's</i>	Student vs. Employee	Student vs. Employee, Adjusted	Importance	Importance, Adjusted
Odds Ratio	0.35	1.6	0.91	1.3
p-value	0.33	0.69	0.84	0.64
Chi-Squared	1.3	0.15	0.039	0.22
p-value	0.26	0.70	0.84	0.64

Table 6: Logistic regression of independent variables from survey with their effect on composting at the Golden Bear Cafe. Independent variables were also adjusted to include only those subjects who ate at the restaurant. Odds ratio and goodness-of-fit are given, as well as their p-values. The "*" symbol indicates significance, with $p < 0.1$ as the threshold.

<i>Golden Bear Cafe</i>	Business Major Model	Business Major Model, Adjusted	Environmental Major Model	Year in School	Year in School, Adjusted
Odds Ratio	1.1	Does Not Work	Does Not Work	1.1	1.4
p-value	0.94	Does Not Work	Does Not Work	0.61	0.19
Chi-Squared	0.0064	1.7	2.0	0.25	1.7
p-value	0.94	0.19	0.16	0.62	0.19

Table 7: Logistic regression of independent variables from survey with their effect on composting at Pat Brown's Grill. Independent variables were also adjusted to include only those subjects who ate at the restaurant. Odds ratio and goodness-of-fit are given, as well as their p-values. The "*" symbol indicates significance, with $p < 0.1$ as the threshold.

<i>Pat Brown's</i>	Business Major Model	Environmental Major Model	Environmental Major Model, Adjusted	Year in School	Year in School, Adjusted
Odds Ratio	Does Not Work	3.0	3.2	1.0	1.2
p-value	Does Not Work	0.049	0.079	0.79	0.40
Chi-Squared	1.9	3.7	2.9	0.071	0.71
p-value	0.17	0.054	0.088	0.79	0.40

Appendix E:

Table 1: T-test analysis of the composting rates at Pat Brown's and the GBC when both restaurants had only informational posters.

t-Test: Two-Sample Assuming Equal Variances

	<i>Pat Brown's (Pre-Experimental)</i>	<i>GBC (Pre-experimental)</i>
Mean	0.013	0.013672
Variance	0.00016	0.00018
Observations	5	5
Pooled Variance	0.00017	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-0.08146	
P(T<=t) one-tail	0.468537	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.937074	
t Critical two-tail	2.306004	

Table 2: T-test analysis of the composting rates at Pat Brown's before and after the volunteer was used at the GBC.

t-Test: Two-Sample Assuming Equal Variances

	<i>Pat Brown's (Pre-Experimental)</i>	<i>Pat Brown's</i>
Mean	0.013	0.00592
Variance	0.00016	4.36E-06
Observations	5	5
Pooled Variance	8.22E-05	
Hypothesized Mean Difference	0	
df	8	
t Stat	1.234878	
P(T<=t) one-tail	0.125956	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.251913	
t Critical two-tail	2.306004	

Table 2: T-test analysis of the composting rates at the GBC before and after the volunteer was used.

t-Test: Two-Sample Assuming Equal Variances

	<i>GBC (Pre-experimental)</i>	<i>GBC</i>
Mean	0.013672	0.01676
Variance	0.00018	6.62E-05
Observations	5	5
Pooled Variance	0.000123	
Hypothesized Mean Difference	0	
df	8	
t Stat	-0.43987	
P(T<=t) one-tail	0.335836	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.671671	
t Critical two-tail	2.306004	

Appendix F:

