UC Berkeley Outdoor Campus Recycling Bins: Can we do Better?

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ABSTRACT

Recycling programs at the University of California, Berkeley, have declined in recent years. The university recycles a relatively low amount of waste compared to other colleges in the San Francisco Bay Area. I examined why there is a low recycling rate at UC Berkeley and explored the impact of an alternative recycling bin design on recycling behavior, seeking to determine whether a change in recycling bin design affects student recycling habits. I tested the hypothesis that poor recycling bin design discourages students to recycle, reducing recycling rates at UC Berkeley. The research consists of a student survey and a week long observation of a current outdoor recycling bin on campus. Over one month, 134 Berkeley students completed an online survey that revealed student discontent with UC Berkeley's current public outdoor recycling bins due to bin design and insufficient quantity of outdoor recycling bins. The survey revealed that bin design affects recycling behavior by influencing student decisions to utilize recycling bins. Outdoor bin observations revealed unexpected bottle/can collectors that may be another cause in reducing recycling rates at UC Berkeley. The results supported the hypothesis, but also revealed that poor bin design is not the only factor affecting recycling rates on campus. Bottle and can collectors, insufficiency of recycling bins, and lack of education may be other contributors to low recycling rates at UC Berkeley. Improvements in recycling bin design can lead to increased satisfactory amongst users, thereby resulting in more willingness to recycle and improvement in recycling rates.

KEYWORDS

Doty bin, recycling behavior, student survey, bin observation, bin design

INTRODUCTION

Recycling is an important means of reducing resource consumption and pollution, minimizing the natural resources and energy needed to produce materials and saving landfill space by reducing waste. Each year, Americans use about 85 million tons of paper, 14 million tons of plastic, and 13.6 million tons of glass (EPA 2008). In 1999, about 72 percent of waste was buried in landfills, at a cost of over $30 billion (Dietz 2002). In addition to saving landfill space, reducing waste lowers disposal fees (Dietz 2002). Recycling one ton of paper cuts greenhouse gas emissions by one metric ton of carbon equivalent, conserves about 7,000 gallons of water, preserves 3.3 cubic yards of landfill space, and saves enough energy to power the average American home for six months (EPA 2008). Thus, it is important to consider how to promote recycling and encourage recycling behavior.

At the University of California, Berkeley, recycling programs have declined slowly over time. Since 2001, UC Berkeley has held annual recycling and sustainability summits, giving rise to various programs promoting sustainability and awareness of environmental issues. At the first Recycling Summit, determined students and staff sought to promote recycling on campus by increasing access to indoor and outdoor recycling and refuse containers, campus-wide purchasing of recycled paper, and establishing a materials exchange (Recycling Summit 2001). Two years later, all of these programs had proven very successful except for one, increasing the number of indoor and outdoor recycling bins on campus (Recycling Summit 2003). Although about 55 new multi-material containers for recycling were distributed throughout the UC Berkeley campus in 2001-2002, Lisa Bauer, the manager of Campus Recycling and Refuse Services, contended that efforts "have fallen short in the goals to improve recycling due to a lack of funding and staffing" (Recycling Summit 2002). Efforts to encourage recycling on campus have been overshadowed by new efforts to achieve sustainability. After three years, the focus of recycling summits shifted from recycling to other sustainability issues, ultimately leading to the replacement of the annual *recycling* summit with the *sustainability* summit in 2004. Since then, many recycling programs and plans to place sufficient recycling bins on campus have been buried beneath new sustainability programs such as the Go Solar Campaign, placement of new solar panels atop the Martin Luther King Student Union Roof, and the creation of the Chancellor's Advisory Committee on Sustainability (SUC 2005). In an attempt to expand efforts

towards achieving sustainability, UC Berkeley has deviated from past goals focused on increasing recycling rates on campus.

Compared to other major universities and colleges in the San Francisco Bay Area, UC Berkeley diverts, or recycles, a relatively low amount of waste. Including construction and demolition waste, UC Berkeley currently recycles 57% of the waste generated on campus, while San Francisco State University diverts 76% and Stanford recycles 60% (ACSRRB 2006). The relatively low percentage of waste diversion at UC Berkeley may be due to inefficiency and inconvenience resulting from inadequate number of available recycling bins around campus and poor recycling bin design. While there is no research on why recycling rates are low at UC Berkeley, research in Canada suggests an explanation. In a study conducted by one of Canada's green government programs, replacing traditional office trash cans with smaller recycling bins increased recycling levels, suggesting a change of recycling behavior by office employees (CIWMB 2002). By decreasing the size of the trash cans, employees were forced to think about how much waste they generated and what they were throwing away. Following this example, the Bank of Nova Scotia was achieved 80% waste diversion by replacing traditional trash bins with mini bins. Public and private office buildings in the United States also have succeeded in improving recycling rates using the same approach, demonstrating the importance of waste bin design in shaping recycling behavior and awareness (CIWMB 2002). By altering the bins in a way that encourages recycling habits, a change in design of UC Berkeley's outdoor recycling bins may also have significant effects on the school's waste diversion rates.

In a recent study conducted by the UC Berkeley Graduate Assembly Environmental Sustainability Committee (GAESC), a group of graduate students concerned with the lack of recycling on campus surveyed over 500 graduate and undergraduate students to explore student awareness and opinion of current recycling bins around campus. The study revealed that 70% of the respondents wanted the university to place additional recycling bins outside buildings, 44% thought the current recycling bins were not well identified (could not differentiate between regular trash bins and recycling bins), and a number of respondents recommended improving recycling bin design for clarity and visibility (GAESC 2009). This suggests that students support improvements in recycling bin design and placement of additional bins on campus.

The GAESC also received funding to develop a new multi-material recycling bin design and installation of 50 additional outside recycling bins on campus. Currently, UC Berkeley's

outdoor recycling bin designs include the “Doty” bins, “silver bullets” and compartmented black bins (Fig. 1). However, because the majority of the outdoor recycling bins on campus are the “Doty” bins, I focused solely on the “Doty” bins for my study.

Figure 1. Current public outdoor recycling bins at UC Berkeley. Silver Bullet (left). Doty Bin (right).

I examined why there is a low recycling rate at UC Berkeley and explored student recycling behavior on campus, seeking to determine whether a change in the recycling bin design affects recycling behavior. I tested the hypothesis that low diversion rates at UC Berkeley is due to poor recycling bin design. In order to understand the effects of recycling bin availability and design on student recycling behavior at UC Berkeley, I conducted a student survey and a week long detailed observation of what was being thrown away into one of the current Doty bins on campus. The student survey allowed me to directly obtain information about student recycling habits, attitudes toward recycling bin availability, and opinions concerning recycling bin design. The observations of the current recycling bin allowed me to discover unexpected bottle/can collectors who took recyclables from the bins. I also discovered that students were throwing away most of their trash into the “other waste” component of the Doty bin, suggesting poor labeling of the bins and/or lack of knowledge regarding what can and cannot be recycled.

METHODS

My research consisted of a student survey and a week long observation of a Doty bin on UC Berkeley campus. The student survey allowed me to understand recycling habits of Berkeley students, as well as student attitude and opinion regarding outdoor recycling bins. The Doty bin observation allowed me to investigate any patterns of bin use and other factors that may alter recycling rates.

To avoid location bias, I conducted an online survey using www.surveymonkey.com. I contacted various student groups on campus to complete the surveys. The survey was intended for Berkeley students only. A total of 134 UC Berkeley undergraduate and graduate students filled out the survey. Because a previous survey was conducted by members of the Graduate Assembly's Environmental Sustainability Committee (GAESC) to assess awareness of recycling at UC Berkeley, my survey only regarded student behavior and recycling habits. The online survey was open for one month, giving students enough time to respond to the survey. The survey contained questions about students' recycling habits, reasons for not recycling, opinion of UC Berkeley's current recycling bin, and the willingness to help fund replacement of old recycling bins with re-designed bins. I analyzed the survey data by comparing percentages of different responses.

For seven days, with the help of another student, I observed a Doty bin located in front of the Golden Bear Café from 9AM until 2PM. I set up a table approximately 20 feet from the bin, and took note of all waste that was being thrown away into the bin. I used a chart (Fig. 2) to organize what the students were throwing away, including a notes section where I commented on any unexpected activity. I analyzed the data by comparing percentages of what was being thrown away, the accuracy of recyclables in the correct section, and whether the students were hesitant (pause for more than five seconds) when throwing away their trash.

#	Male/ Female	Bottles(B)/ Cans(C)	Mixed Paper	Other Waste	Not Identifiable	Correct Section (Y/N)	Hesitant (Y/N)	Notes
1	F		Paper			Yes	No	10:44AM, 2 males looked inside bin for recyclables
2	F			Apple		Yes	No	
... 80	F			Coffee Cup		No	No	11:23AM, 1 male takes 2 plastic bottles – access through back of bin

Figure 2. Example of chart used for observation of waste being thrown away by individual students at UC Berkeley.

RESULTS

Survey Respondents

A total of 134 students have completed the online survey that was open for one month. Fourth year students, comprised 36.1% (Fig. 3) of respondents, while 67.2% were female, 32.1% were male, and 0.7% preferred not to say.

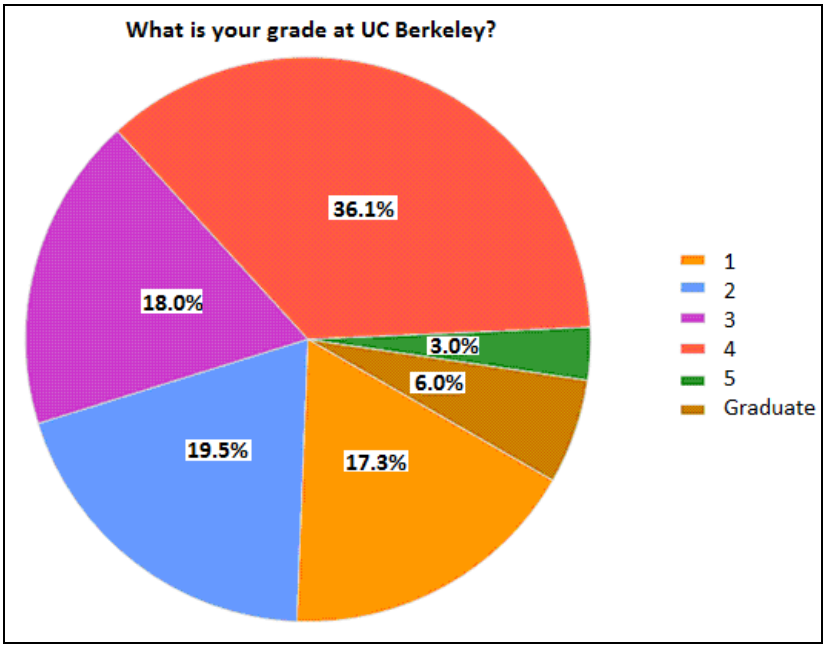

Figure 3. Grade level of surveyed UCB students.

Recycling Behavior

Students were asked how often they recycled items at home, at UC Berkeley campus, and elsewhere other than at home or school. Approximately 36.6% of students said they recycled at home all times (Fig. 4), in comparison to 17.2% who said they used the outdoor recycling bins all the time at UC Berkeley (Fig. 5). Overall, 74.4% of respondents considered themselves as regular recyclers.

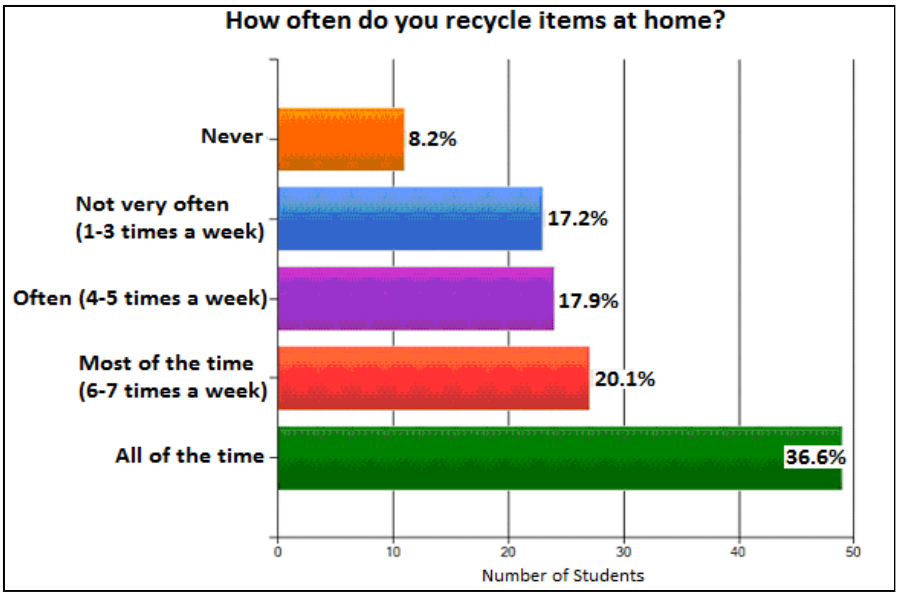

Figure 4. Number of students and their frequency of recycling items at home.

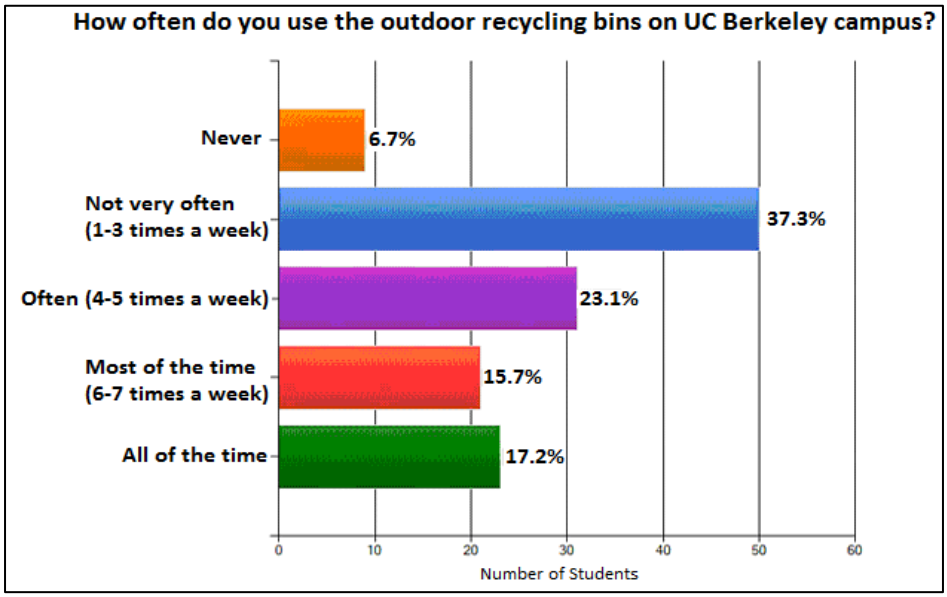

Figure 5. Number of students and their frequency on use of outdoor recycling bins on UC Berkeley campus.

Recycling on campus

Approximately 93.2% students stated they were aware of the outdoor recycling bins on UC Berkeley campus. While 54.5% of students said they were satisfied with the outdoor recycling bins on campus, only 36.1% thought the bins were aesthetically pleasing. More than half, 63.9% of students said they would support an investment from the university to place additional outdoor recycling bins at UC Berkeley. Moreover, 28.3% stated they were willing to

give personal funds for the investment. When students were asked the main reasons for not recycling on campus, 62.2% said it was due to recycling bin accessibility/visibility, 44.1% said they were uncertain whether material was recyclable, and 16.2% said it was due to recycling bin design (Fig. 6). Also, 65.9% of the students believed informational signs would make the current outdoor recycling bins more appealing to them, and 86.2% thought a different color, shape, or material would also make the bins more appealing (Fig. 7). In the open comments box, several students complained that the current recycling bins were dirty, too small, damaged, old fashioned, inconsistent in design, and had poor labeling. Other students suggested there should also be composting bins along with the outdoor recycling bins.

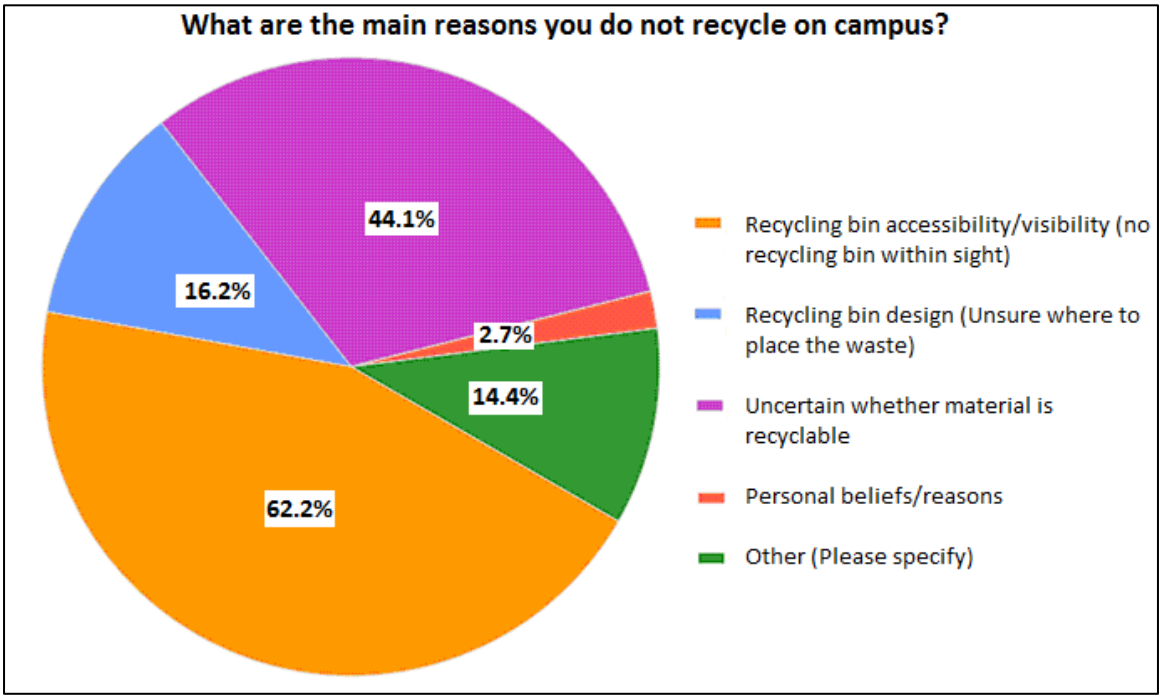

Figure 6. Percentage of students who do not recycle on campus due to various reasons.

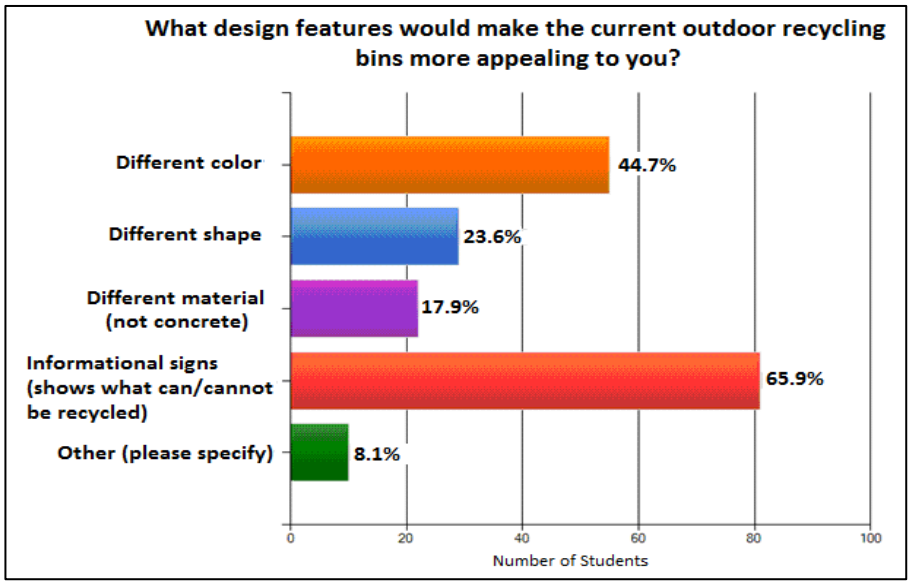

Figure 7. Number of students and design features students thought would make the current outdoor recycling bins more appealing to them.

Doty Bin Observations

Over seven days, a total of 80 students were observed using the Doty Bin located in front of the Golden Bear Café. About 18.8% of the waste was thrown away in the "bottles and cans" section of the Doty, 28.8% was thrown away in "mixed paper", and 52.5% was thrown into the "other waste" section (Fig. 8). Less than three-quarters, 71.3%, threw away their waste in the correction section of the bin, while 28.7% did not. Approximately 91.2% of the students did not hesitate to throw away their trash, while 8.8% showed hesitation.

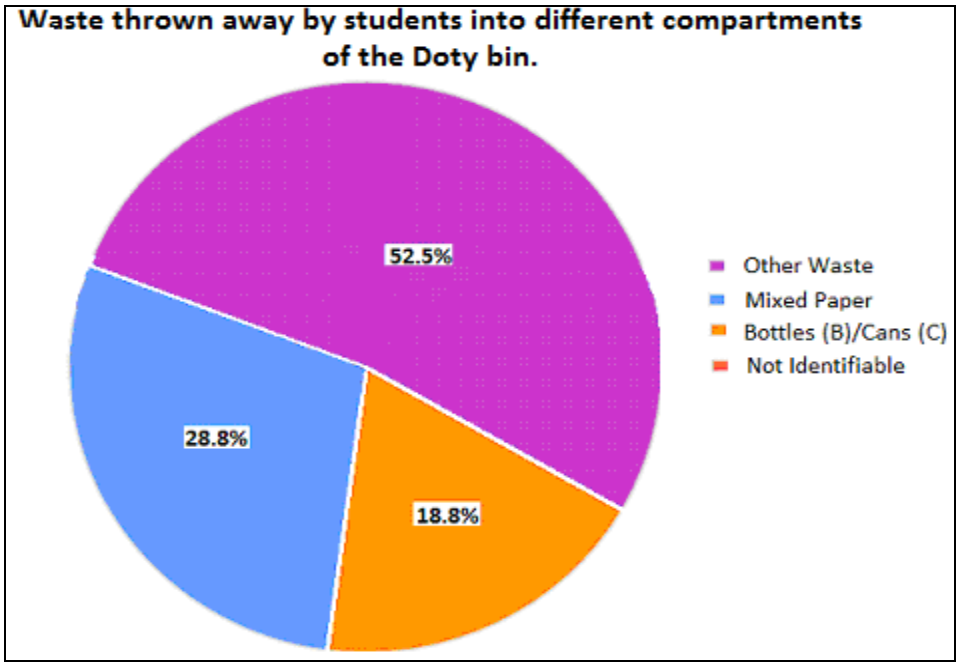

Figure 8. Percentage of waste thrown away into the different compartments of the Doty bin.

Bottle and Can Collectors

During all seven days, at intervals ranging from every 30 minutes to an hour, various persons looked into the "bottles and cans" section of the Doty bin. Upon discovering bottles and cans inside the bin, the collector accessed the bin by opening the back door of the bin and took almost all the bottles and cans from the section. The collectors did not touch the other sections of the bins, ignoring other bottles and cans that may have been thrown away in the wrong section. There were different collectors, both male and female, and some collectors went through the bin more than once or even three times a day. The collectors also took bottles and cans from nearby Doty bins as well.

DISCUSSION

The survey results show that students are clearly recycling less on campus, in comparison to the frequency that students recycle at home. In accordance to my hypothesis, the results suggest this may be due to bin design issues. However, other factors such as inadequate bin supply and lack of education are other factors that may also discourage students from recycling on campus and lead to reduced recycling rates at UC Berkeley. Bottle/can collectors is another factor that may contribute to lowered recycling rates on campus.

The student survey reveals that the main reason students did not recycle on campus was because of recycling bin accessibility and visibility. Currently, UC Berkeley has about 55 outdoor recycling bins on campus. According to students, this is an inadequate number of bins. One-fourth of surveyed students were even willing to give personal funds towards implementing additional recycling bins on campus. In a survey conducted by the Graduate Assembly's Environmental Sustainability Committee, 70% of the 500 surveyed students supported additional bins on campus (GSEAC 2009). The map of current outdoor recycling bins show areas that lack sufficient recycling bins, such as the northwest, northeast, east, and southwest parts of campus (Fig. 9). Lack of sufficient recycling bins around campus encourages students to use the more accessible regular trash bins instead of the recycling bins that require students to walk up to several additional hundred feet. In a study conducted by students at LeHigh University, a survey of students found that the main reason students did not recycle was due to laziness and lack of concern for the environment. The results of the survey were confirmed when observations of students throwing away their food at the school's cafeteria revealed that, even those who recycled only recycled cans and bottles, if any. Students were less likely to go out of their way to recycle when bins required a few extra steps to the opposite side of the cafeteria from the regular trash bins (Chouhoud 2003). Additional recycling bins on campus will encourage students to utilize recycling bins more frequently. Future studies, however, should be conducted to determine whether a correlation between laziness recycling behavior exists.

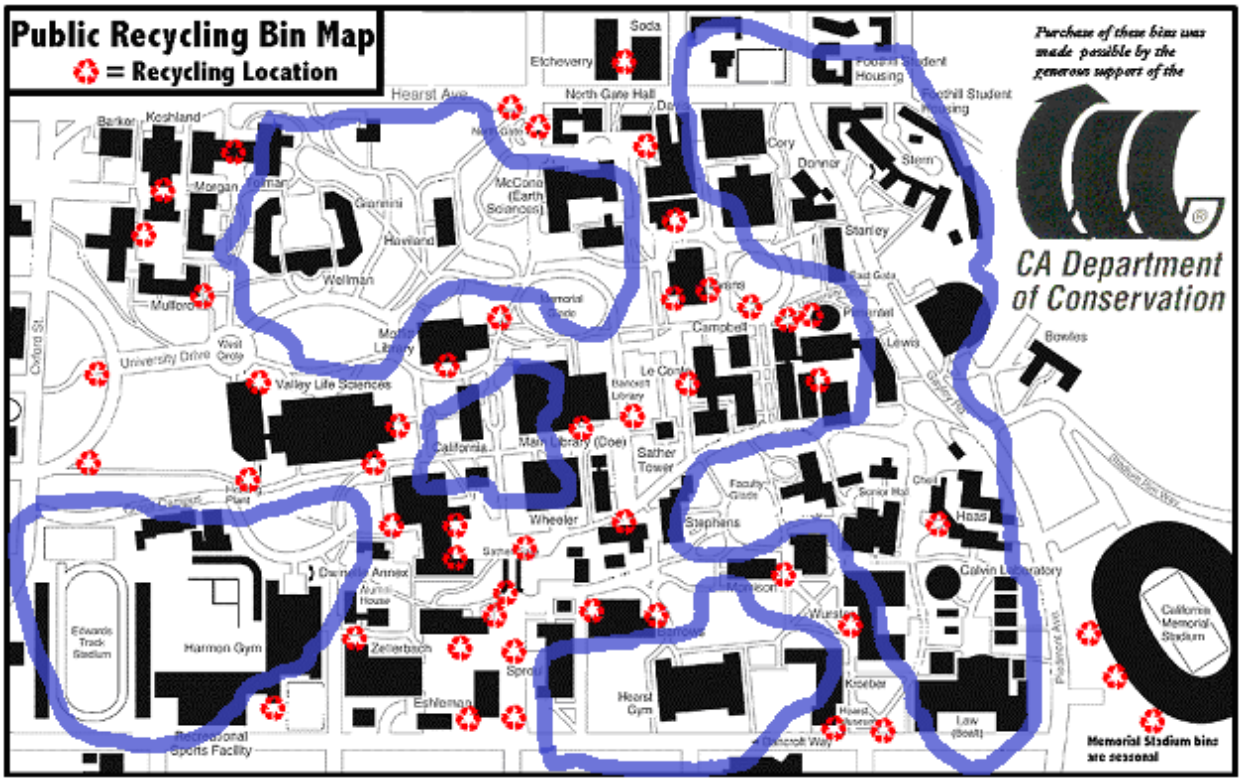

Figure 9. Map of current public outdoor recycling bins around UC Berkeley campus. Areas with none or few recycling bins are highlighted in blue.

The second main reason students did not recycle on campus was because they were uncertain whether their trash was recyclable or not. Student preference of informational signs in regards to making the bins more appealing implies that students do not know what materials are recyclable. The study conducted by the GAESC supports this, revealing that 60% of surveyed Berkeley students were confused as to whether certain materials were recyclable or not (GSEAC 2009). This suggests a lack of knowledge and a necessity to educate students on what can and cannot be recycled. In a study conducted by the California Waste Management Board, 73% of people surveyed agreed that more money should go into educating the public about reducing waste and recycling (Trumbull 1983). Students who do not know where to throw away their trash are more likely to throw away in the regular bins to avoid confusion, or may just throw away in the "other waste" section of the Doty bin. In another study conducted by Andrea Buglione, students were given various materials and asked to place the materials in the section of the recycling bin which they thought was correct. The study concluded that there was a general confusion about what recycling is at the fundamental level (Buglione 2009). One way to reduce confusion and educate students is to improve the labeling of bins and include informational signs

near or on the bins indicating what material can be recycled and to which section it belongs. Educating students is important because knowing what can and cannot be recycled is vital when students make the decision to throw away their trash.

In support of my hypothesis, the third main reason students did not recycle on campus is due to poor recycling bin design. All survey respondents indicated that an improvement to the recycling bin, such as different color, shape, material, and/or informational signs, would make the bins more appealing. Students did not want to approach damaged bins with small holes that required them to almost come in contact with the dirty bins. Students also suggested including a compost section to the bins. Moreover, students felt confusion from the inconsistency in design of the various recycling bins around campus (silver bullets, Doty bins, compartmented black bins). In addition to placing more recycling bins on campus, current bins can be replaced with newer bins that have a universal design to reduce confusion and make the recycling bins more approachable. In a study conducted by the California Integrated Waste Management Board, replacement of large trash bins to smaller bins led to a 50% reduction in waste. This supports the idea that a change in bin design can lead to changes in behavior (CIWMB 2002).

The most important discovery of the study was unexpected persons who took almost all of the bottles and cans from the recycling bins on an hourly basis. This observation plays a significant part in the explanation of reduced recycling rates on campus. Collectors take bottles and cans that students have successfully recycled on campus, decreasing the amount of waste that has been recycled by students.

Recycling bin design is important in encouraging recycling behavior, but we must also consider educating the public about recycling as well as increasing the number of bins on campus. Further study is encouraged to determine the effects of education and bin quantity on recycling behavior. Another potential future study may focus on composting programs, for which students showed high interest in the open comments section of my survey. What are the differences and similarities between recycling and composting programs and services at UC Berkeley? Is it efficient to provide composting bins as well? Most importantly, future study should examine the effects of bottle and can collectors on recycling rate.

The study shows that improvement in recycling bin design can lead to increased satisfactory amongst users, thereby resulting in more willingness to recycle and ultimately increase recycling rates. In addition to bin design, other factors such as increased education on

recycling, abundance of recycling bins, and bottle/can collectors are crucial in understanding why UC Berkeley has low diversion rates in comparison to other schools. As stated earlier, it is vital that we conserve our natural resources by reducing consumption of virgin material through recycling. By reducing waste and saving landfill space, we are pushing for a healthy environment. As Hoq states in his book, Aspects of Solid Waste Management, community participation is important in managing waste and maintaining a healthy environment (Hoq 1994). UC Berkeley can set an example for other universities and colleges, and this study can encourage other students to explore issues around recycling at their campuses.

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