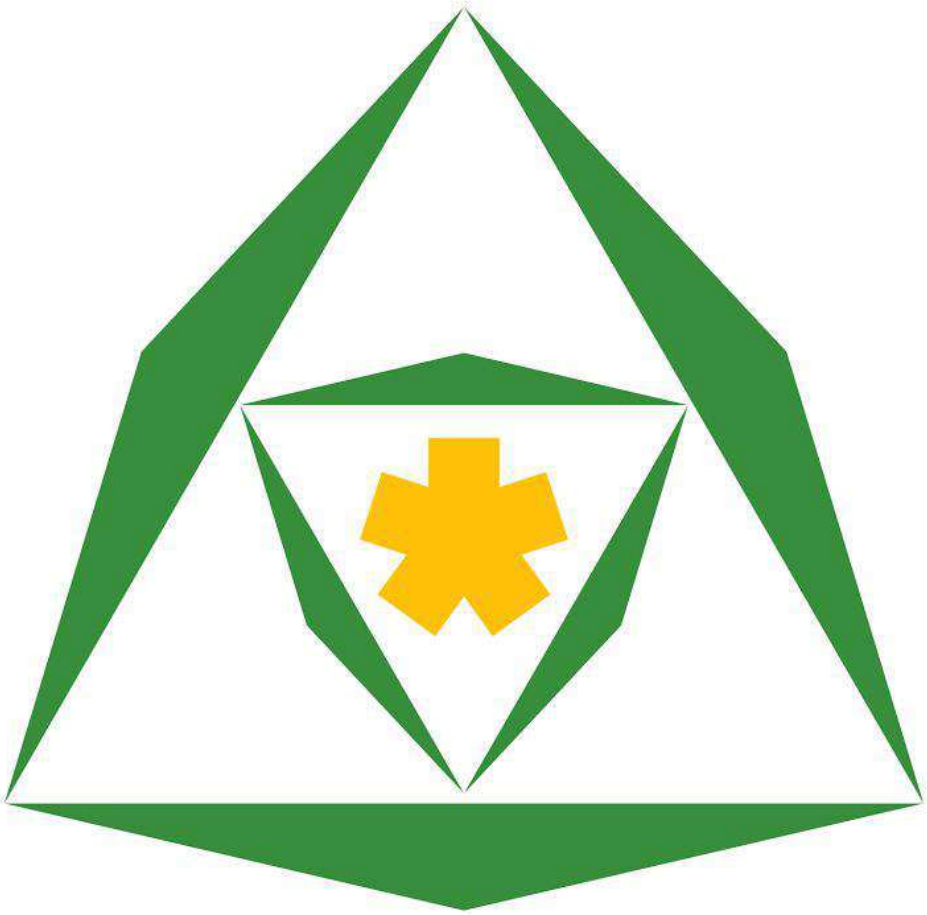
SASSHOLES 4 CHANGE



DESIGN BRIEF

COGS 102C: COGNITIVE DESIGN STUDIO

SPRING 2017

Table of Contents

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Overview

Team Sassholes 4 Change was born out of a desire to prevent and reduce food waste at UCSD. To do this, we went through a rigorous and thorough design process, drawing on all the resources available to us, to finally arrive at our proposed solution: Disposal Bin Covers.

Progress Tracker
Team Folder

Section I: Understand

Design Challenge

What is your design problem / challenge / opportunity?

We decided to tackle the issue of food waste on the UCSD campus, focusing on the concept of the importance of separating food waste from other waste so that it can break down organically. We therefore framed our challenge with the following question:

How can we reduce the amount of food waste generated by UCSD that ends up in landfills?

Conceptual Dimensions

Describe the conceptual dimensions of your design challenge. Why is yours a problem worth solving? Draw on secondary research to provide background. Use your primary research to support claims about how people think about the issue.

Food waste is defined as "[u]neaten food and food preparation wastes from residences and commercial establishments" (US EPA). It is an urgent global issue that contributes to climate change in the form of methane emissions and wastes natural resources used to produce food (i.e. energy, water, labor, etc.). People may be consciously aware of food waste, but generally do not consider the magnitude of waste generated due to the lack of both transparency in the food industry and

societal feedback that strongly discourages wasteful behavior. This was strongly evidenced by our user interviews and observations. Awareness of food waste as an issue was verbally admitted, but most users tended not to separate their meal waste in dining halls, leading to post-consumer waste.

Physical Dimensions

Describe the physical dimensions of your design challenge. Based on your research, discuss how physical elements and context create barriers, obstacles, constraints, and/or opportunities for perception, action, and interaction. Include at least two photos to illustrate.

The physical dimensions of our design challenge specifically relate to the information present above trash receptacles and the issue of a lack of a proper availability of bins. In areas where food is sold or eaten, there must be infrastructure that supports the separation of trash. Housing-Dining-Hospitality (HDH) dining halls and markets on campus are equipped with three bins: Food Waste, Recycle, and Trash. Despite the presence of informative signage, with pictures and three-dimensional examples of which items go where, consumers often do not take the time to separate their waste properly (Fig. 1). They spend, on average, 3 seconds at the receptacles and usually opt to swiftly throw everything in the general trash.

Not all places, however, have this infrastructure set up. Other areas on campus do not have this exact setup, lacking specifically, food waste receptacles (Fig. 2). These areas include lecture halls, discussion rooms, and paved roads on campus. Surprisingly, even Price Center, a heavily traveled courtyard eatery, does not have any food scrap bins. The only bins present are Trash and Recycle. Thus, students do not even have the option to throw away their food waste in a proper bin in the majority of campus.

Figure 1. *(Left)* Disposal station at Pines.

(Right) Food Scraps bin at Pines. Note contamination of bin contents.

Figure 2. Campus-regulated bins. Note the lack of a food scrap bin.

Social Dimensions

Describe social dimensions of your design challenge. Based on your research, discuss how social interaction, activities, modes of participation, identities, etc. relate to your design problem.

Preventing food waste is a widely held objective. Despite verbal affirmation of the importance of this issue, user actions reveal that users prioritize convenience over ecological values. As stated in Physical Dimensions, people on the UCSD campus face structural obstacles that make separating food waste from other waste extremely inconvenient. In fact, people stand to lose more social capital from carrying around leftover food (i.e. odor, attraction of insects, added bulk to bags). Only a few people interviewed actually goes through the effort of separating food waste. Additionally, the opaque and often hidden nature of waste receptacles conceals what people actually throw away and shields them from social consequences.

However, the UCSD campus does provide social dimensions to leverage. For one, the three separate bins in dining halls provide a model of waste separation and exhibit the failure to affect behaviors. This model is also something that a portion of the UCSD population will be familiar with, given that many students start out their university career in the campus dorms. Lastly, UCSD, with its stated grand research theme to “understand and protect the planet” (UCSD Strategic Plan Executive

Summary) has no shortage of student-led or staff-led efforts to effect better environmental practices and educate the population on issues.

Needfinding

Discuss your primary research methods used during the needfinding stage. How many people did you observe and talk with? How, where, and when did you collect data?

We first conducted user interviews and observations and researched secondary sources to discover the local and general problem spaces for food waste.

Interviews were conducted with UCSD students and staff, and relevant organizations outside of UCSD. These were usually done in spaces where dining and, subsequently, food disposal are conducted. We also interviewed UCSD students who actively participate in food waste reduction efforts, such as members of on-campus Community Gardens or the student-led Food Recovery Network. These interviews were helpful in understanding the capacity for campus compost and how we could potentially use the campus gardens as a resource. In total, we conducted approximately 30 interviews.

We observed users in various locations, such as campus dining eateries and grocery stores, to get a better sense of food disposal habits and food purchasing habits to better examine the issue of food waste from every perspective. Numerous students were observed by trash receptacles and notes were taken on whether students used all three receptacles, separated their trash, how long it took them to separate their trash, and whether they looked for extra information to help them separate their trash. These observations helped identify behaviors of our target audience and potential areas for design opportunity.

Our secondary research also generated discussion topics and bases of ideas as we tried to understand what other groups have done and are doing to combat this issue. We took ideas from secondary sources and combined them with our observations to define a need: the lack of food waste receptacles in non-HDH locations.

Target Audience

Who is your target audience? What are their defining features?

Our target audience are the students at UC San Diego. College students represent the extreme end of the WEIRD (Western, Educated, Industrialized, Rich, and Democratic) demographic (Kingwell) and fewer than twelve percent of the world's population is represented by the WEIRD demographic overall, which provides us a target audience narrow yet large enough to work with (Brookshire). Industrialized and wealthy nations tend to see much more food waste once the food has been purchased for consumption (Royte, National Geographic). Focusing on this audience presents an opportunity to design for those who are both contributing to the problem and far removed from its consequences. Moreover, this group is educated and tends to care about environmental and social issues. These values can certainly be leveraged to bring about action.

Demographics

Describe your target audience in terms of relevant demographics (e.g. age, gender, where they live, etc.). How big or small is your target audience?

Our target audience demographics include college students at UCSD who are between 18-24 years old, inclusive of all gender identities, and who are living on or off-campus. Our target audience is quite large as we have seen that food waste is a general problem amongst college students. The way we decided to manage this enormous demographic is by further narrowing our audience within the UCSD campus, which although still quite large, provides us with a more localized testing ground.

This audience tends to live off-campus, without university-required meal plans that could be spent only at HDH locations. Commutes to and from campus also mean that users likely had heavy bags that discourage the addition of bulky and awkward items, such as food containers. Members of our target audience arrive at and depart campus at varying times, but it was highly likely that they would be on campus for the duration of at least one meal. A member of the audience might walk throughout the entire campus or remain in a certain area, meaning that our eventual

design solution would have to be generalizable to the entire campus to affect the majority of our target audience.

Psychographics

Describe your target audience in terms of psychographics (e.g. interests, identities, motivations, aspirations, irritations, etc.) Discuss the central tendencies of your target audience as well as possible extremes.

As the members of our target audience fall under the WEIRD demographic, that too the extreme end, there are certain characteristics and traits that define them. College students under the WEIRD demographic tend to, "rationalize choices, reject conformity, favor transient relationships, and be less trusting than other Americans who already exhibit those tendencies" (Kingwell). Overall those under the WEIRD demographic also tend to overestimate self-worth and give more value to their own personal choice. People in these societies tend to be focused more on themselves than on others (Kingwell).

When it comes more specifically to our WEIRD students at UCSD, and in terms of our topic, we found that these students believe time is a valuable resource and that their convenience is very important. They are students who are constantly busy and on-the-go. It appears that for our target audience, trash separation is a process that is both difficult and easy as some items are easy to separate while others can fall in a gray area, which makes it hard to tell where they go. This highlights how our target audience does not want to put in extra cognitive effort or time to figure out what goes where when separating trash, emphasizing how time is a valuable resource for them. However, these are also students who find reading extra signs and information as something not worth their time, so they desire information that is quick and easy to understand. Most members of our target audience seem to have a general idea of what items go in what bin, but still desire assistance in determining exactly what goes in what bin, showing that these are people who want to be certain that they are making the right choice. This desire to be certain, however, gets trumped by how quick and easy a task is, as from our needfinding phase we found that if there is time spent figuring out what trash goes where, it is minimal, emphasizing a desire for speed and efficiency. These are the central tendencies that tend to be present in members of our target audience.

In the case of extremes, on one end, are those members who already have a habit of sorting their trash and take the time to do so in dining areas. At the other extreme are those who do not care about what goes where and simply place all their trash in one receptacle.

Relevancy

Why is your design problem relevant to your target audience? Use your research to support claims.

According to the Huffington Post, the average on-campus college student wastes approximately 141 pounds of food per year, while an individual college campus generates 169,000 pounds of food waste per year overall (Herreria). When put into perspective, these are the statistics for only one campus. If we take these numbers and multiply it by 4,724 (the number of college campuses present in the United States), the annual national generation of food waste equates to approximately 798,356,000 pounds (U.S. Department of Education). College campuses are clear perpetrators of the food waste issue, making them a prime target in this issue. The current solutions put into place do not embody the characteristics of college students — that is, busy, lack time, and desire convenient solutions. Thus, there is reason to devise a solution for this design problem that takes into consideration the issues of our target audience, which has the potential to create massive positive change in the food waste epidemic plaguing our higher education institutions.

Section II: Create

Design Solution

What is your design solution? What are the key elements? How does it work? Why is your design important and valuable?

After defining our problem and gathering data from various sources, we turned to making a physical prototype of our proposed solution to test in the field.

Our Solution: Physical Features

Describe your design solution's physical perceivable features. What is visible, touchable, audible, etc.?

Our prototype is inspired by the shape-recognizing toy for children - only a shape that matches with the opening can be put into the box.

Figure 3. Shape-recognizing toy.

Figure 4. Similarly, our disposal bin covers displayed various irregular openings per bin instead of a single opening per the status quo for current bin models.

We have different shapes of openings on the three bins. For the Trash bin, we have a large round opening for used coffee cups and a large rectangular opening for used napkins and to-go boxes. For the Recycle bin, we have two round shaped openings for aluminum and plastic water bottles and cups, as well as a thinner rectangular-shaped opening for plates, plastic utensils, and papers. For the Food Waste bin, we designed a large oval opening that looks like an open mouth and two eyes above the opening to facilitate social activity. The Food Waste bin looks like a monster waiting for people to feed it. We also wrote “Food Waste” on top of the opening, to further telegraph the bin’s purpose and ensure that people put food scraps in it.

Above each bin, we have pictures of example items that belong to each category. Those pictures include things that are commonly seen at Price Center and can be customized to any location on campus. Above the Trash bin, we placed example pictures such as a Starbucks coffee cup, a Tapex milk tea cup, and a used pizza box. The Recycle Bin has plastic utensils and examples of recyclable bottles. Above the Food Waste bin, we have pictures of sandwiches and pizza. All the pictures are aimed to give people a more intuitive way of figuring out how to separate their trash into the different categories.

The Human Ecosystem

Describe the system in which your design is embedded. Include relevant physical, ecological, cultural, economic, political, and educational aspects of the human ecosystem.

A university atmosphere is saturated with ambition. That is, everyone is there, more or less, with goals for the future. Whether these objectives are centered around one's career, personal growth, or simply maintaining the facade of success, there are reasons for keeping up a life filled with lectures and events and clubs. Along with this comes pressure, stress and anxiety. For better or worse, it is the campus norm to focus on things that directly affect goals and to de-prioritize those that do not (Fig. 5).

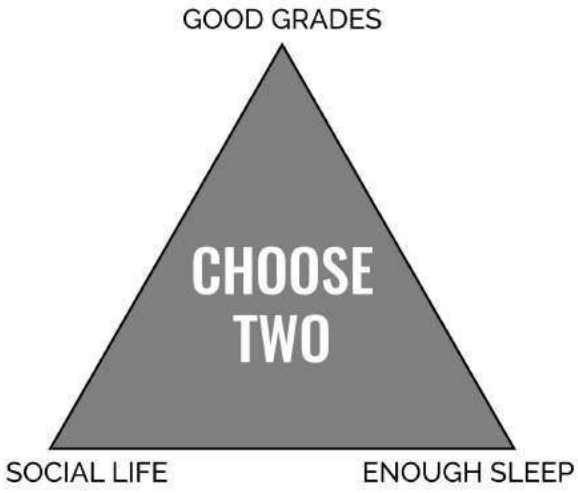


Figure 5. The infamous College Triangle.

Given that it is the university's nature to challenge, educate, and push for cutting-edge ideas, UCSD students and staff attempt to put important issues in focus, discarding taboos in the process (however sanitized this may often be),

exemplified in efforts to make recycling accessible and hosting semi-controversial events such as “Justice in Palestine” week. Whether students like it or not, the atmosphere of the campus is often politicized. However, for many of the mentioned examples, students are often afforded the ability to ignore or sidestep engaging with the politics. Or, students are so inundated with explicitly political messages that they become habituated or overwhelmed. This means that for a design to successfully get students to make what is inherently a politicized decision, it would have to be seamless, minimal effort, and stripped of any obvious political symbology. It is important to acknowledge that, even if there are no political signifiers in the design, that the separation of waste speaks to the issue of environmental protection and, more indirectly, climate change. There may be people who have political beliefs against climate change or the prioritization of environmental protection and their actions may still sidestep waste reduction methods. However, climate-change enjoys popular belief and popular support to combat it, so the issue of a direct political opposition is of little concern.

As a public university, UCSD hosts a diverse set of socioeconomic backgrounds. While everyone is there to participate in higher education, everyone comes in with different types of education and cultural backgrounds. Some may come from areas where composting is a familiar term and there is a social expectation, enforced by laws, to participate. Meanwhile, others may not be familiar with the term or understand the process or why it’s good for the planet. Our design is conscious of the fact that people can’t simply be told to do something or that they *should* do something; it will not have the same effect on everyone and it may be agitating more than anything. Further, some obstacles are simply physical. Our target audience is largely composed of people who frequent dining locations on campus that lack food waste disposal bins - that is, non-HDH locations. Our design is intended to be located in these non-HDH locations. Further, it focused on creating the affordance of a separate food waste receptacle and constraints that necessitated or encouraged the separation.

Human-Bin Interaction

Describe how form and function relate and how people use and interact with your design solution. Do people use your design in one way or many ways? Are there opportunities or requirements for social interaction? Include photographs or illustrations.

Our disposal bins are not radically re-designed; rather, their main form follows that of a standard disposal bin and harnesses established user expectations about the function of a disposal bin. The labels and categorical pictures above the disposal

bins also follow signage conventions on campus (Fig. 6, 7). Though our target audience generally neither reads nor heeds campus signs, these labels and images on our bins help ground the user in a familiar context when encountering the novel covers. The bin covers and irregular openings invite the user to both investigate and attempt to discover the correct opening for their waste. During some of our tests, we noticed that many users in the vicinity glanced at our prototype out of interest, though most did not use it because they did not have any physical waste at the time. Our prototypes were placed in front of pre-existing trash receptacle locations for easier user access to bins. Users could choose to place their waste in the pre-existing trash receptacles or use our prototypes (Fig. 7). Despite our worries that users would elect to use the more familiar disposal bins, many users did engage with our prototypes by throwing away their waste in our bins. After examining our prototypes after testing, we observed that usage was quite accurate in separation of all trash types (Fig. 8).

We interpreted these positive results to be due to our prototype design, harnessing the novelty of the bin covers and the user tendency to increase social benefit to generate potentials for success.

Figure 6. *(Left)* Recycle prototype. Note the shape of the bin and openings. *(Right)* Trash prototype. Note the shape of the openings and the contents of the bin.

Figure 7. Testing in the field. *(Left)* User using our Recycle prototype. *(Right)* User using pre-existing disposal receptacle at Price Center.

Figure 8. A look inside our prototypes after testing at Price Center. Note contents of bins. *(Left)* Recycle prototype. *(Right)* Food Waste prototype.

User Results

What are the results, outcomes, and benefits for users? What do they get out of it? Describe why your design solution has value.

Our design solution fulfills a need - that is, the lack of a place to put food waste in non-HDH areas. The bin covers maintain a sense of value and usefulness about the user's waste. Users will know that they have benefited the environment in successful separation of food waste. The additional constraints in our solution also subtly guides the user to correct separation, as well as seeming less time-consuming for the user. Additionally, users get to experience a greater sense of accomplishment, derived from matching waste to its correct categories, when using our bin covers.

On the other side of the process, this separation makes it easier to get waste to the appropriate areas. The Food Waste bin is outfitted with a compostable bag. Not only can that waste be easily transported to any of the compost bins or gardens on campus or to locations off-campus, but it can be placed into the final receptacle with the bag itself. This greatly simplifies the process for those collecting and transporting the waste.

Data-Driven Design

How did data inform the development of your solution?

Rather than jumping to ideating for solutions, we focused first on researching how food waste occurred at UCSD in order to find the right problem to solve.

Our Story: Design Development

Tell your story of design development.
What key design features did you strive for and how did you select them?

We first started collecting data from user interviews, observations, and secondary sources. After pooling our data, we decided to focus on the principles of ***incentive***, ***convenience***, and ***aesthetics*** in our design solution. At team meetings, we ideated and narrowed down our list of ideas based on feasibility and the values above. We then split the ideas amongst ourselves to produce individual mockups to test with our classmates, then narrowed down ideas further based on our results.

- **Incentive:** We want people to know the impact of food waste on the environment, and how individuals can contribute (by trash separation) to help reduce the consequences of this habit
- **Convenience:** According to Don Norman, a good design needs to have enough signifiers to tell the users how to interact with and convey the function of each part (Norman, *Design of Everyday Things*). We wanted to make our design easy and intuitive to use.
- **Aesthetics:** We want our design to be eye-catching and aesthetically-designed so that people are willing to use it.

Following these principles, we came up with our first prototyped trash can with an educational sign on top to both inform and provide a location to deal with the issue of food waste (Fig. 9). In addition, we had signs written with names of different categories.

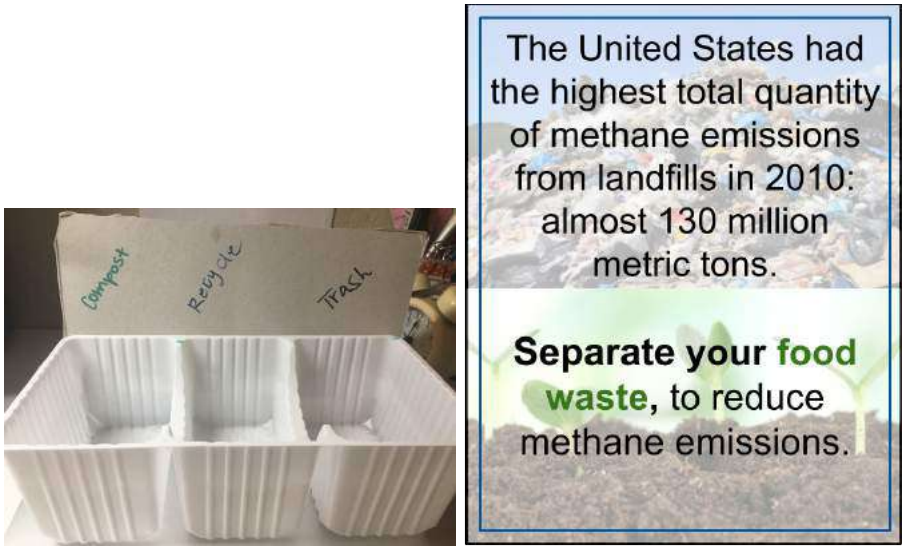


Figure 9. *(Left)* Early prototype. *(Right)* Accompanying sign of early prototype.

Figure 10. Early signage prototypes.

From user testing, we learned that even though the sign itself only stated the importance of trash separation, which accomplishes the "incentive" principle of design, it did not tell the testers what they should put into each can. Therefore, the words "Compost, Recycle, Trash" above the bin became the only cue for testers to categorize their trash. While all people were separating their trash, some people spent a longer time wondering "What Goes Where". The sign did not work well with respect to our proposed "convenience" design principle - the label above the disposal bin should have been more intuitive. For example, instead of just saying "Compost, Recycle, Trash", the sign should also contain graphs or images of things that should be put into that category.

Based on user feedback and observations, we came up with our final prototype (Fig. 11).

Figure 11. Final prototypes.

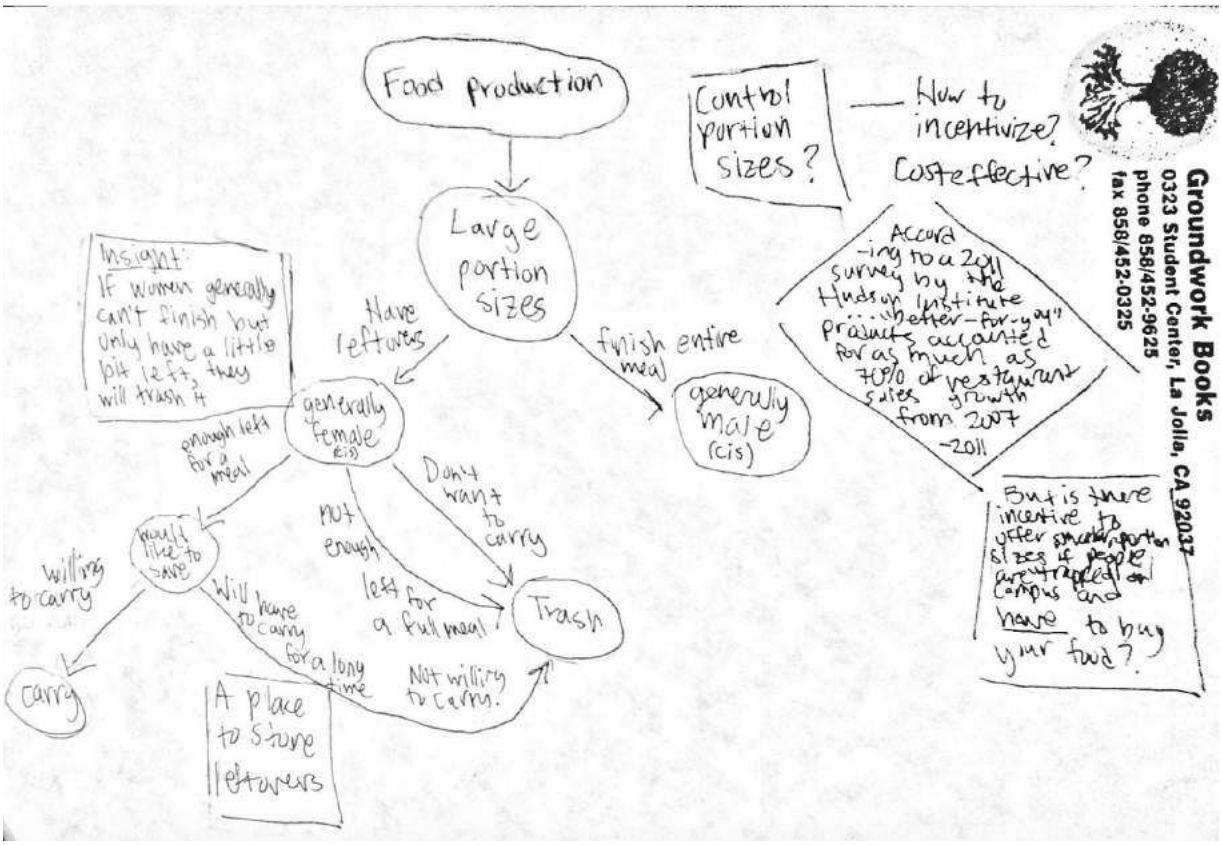
Our Thinking: Design Models

What model(s) guided your thinking?

To aide us in thinking about the multifaceted environment that students work and live in and keep all possibilities and current solutions in perspective, we made a flow diagram (Fig. 12). This diagram models some of the challenges that students face and the choices they subsequently make. It helped to produce points of insight as to when and where people trash food. For example, at one point we realized that if someone bought food at school and they did not finish the food, they would have to make a choice whether to carry it around or not. The students who would choose not to presented an opportunity to design for an alternative to simply trashing the food. Taking a step back, we also identified an opportunity to change the portion sizes that the UCSD vendors serve. But converging (similar to what we did with a Pugh Chart, described below) would ultimately rule out this idea.

A Pugh Chart (Fig. 12) helped to narrow down ideas to a manageable amount to prototype. Convenience, aesthetic, and incentive were the units of measurement that we evaluated our ideas against. Ideas were also evaluated for feasibility and testability. Ultimately, the Pugh chart helped us to rule out a fridge organizing idea and a program to divert local store waste to the shelters and food pantries because it would be hard for our group to test. The Pugh chart helped us to remain focus on fulfilling our principles and helped to identify future challenges. For example, we found that some ideas would only fulfill aesthetic if we actually built them to be

aesthetically pleasing and could only be evaluated for their aesthetic potential at mock-up stage.



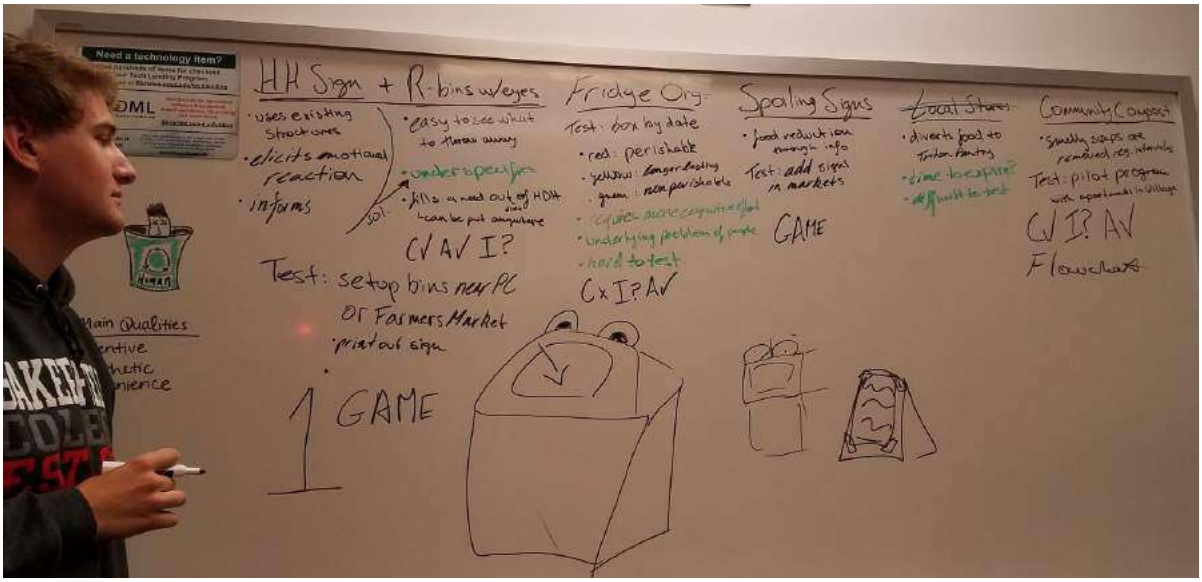


Figure 12. *(Top)* A flow diagram that maps users' challenges (i.e. large portion sizes) and their ways of dealing with challenges (i.e. throwing food away, carrying around leftovers). *(Bottom)* A rough Pugh model in our early ideation phase.

Competitive Analysis

What did you learn from competitive analysis, i.e. looking at how others solved the same or similar problems?

In researching the issue of food waste, we also searched for solutions proposed by other groups with both primary and secondary research. The HDH department also helped us better understand how food waste was generated at UCSD and how post-consumer waste was a much more serious problem than that of pre-consumer waste. Extrapolating from this information, we noticed that larger organizations with greater autonomy fund consumer awareness campaigns, hoping to target the issue at the root of the main cause. For example, the Canadian program MisFits Fruits & Veggies sells misshapen produce at a discount, offering fiscal incentive while simultaneously increasing awareness about food waste (Fig. 13). Other class teams focusing on food waste targeted areas we considered, but ultimately rejected, such as a Tupperware program to better save leftovers or food calendars to keep track of expiry dates.

Figure 13. A MisFits stand in a Canadian supermarket, displaying discounted prices.

Our Prototypes: Implementing Design

How did your prototypes embody key design features?

Our prototypes focused on function rather than form. The irregular openings capitalized on the pre-existing concepts of shape and Gestalt principles to convey the bin's function to users. Simplicity and convenience were our primary design features in order for our prototype to provide a successful solution to our design challenge.

Simplicity

Our goal was to come up with a design that would minimize the cognitive effort necessary for users to properly dispose of their trash. To achieve this, we added the lids with compartments feature to the existing bins. This added feature intended to act as (1) a positive constraint that would subconsciously break the automatic process of trash disposal and (2) a guide that would complete a portion of the thought process required for properly separating trash before disposal.

Because this automatic process would be broken, users would have to make the conscious decision of disposing of their trash. However, the user would not be required to think too much about which item goes in which bin because the shape constraints would already complete part of this thought process for the user, simplifying and reducing the length of the process for the user.

Convenience

Another critical feature was to make this process as convenient as possible for our target users so that users would identify the process of separating their trash as an easy and positive experience. We addressed this by personalizing the compartments to items commonly found around the location in which the bins would be placed as well as by adding signs above each bin with images of common items that would be thrown away around the area of placement. This feature would then turn the process of properly separating trash into a fast process because users would only require to find a compartment with the appropriate size for their trash or look at the visuals and find the item they would like to dispose of above the respective bin.

These two design features were aimed to reduce the overall cognitive and physical effort and energy required in the both the cognitive process of determining the appropriate bin for trash items and the physical process of actually throwing away the trash into their respective bins.

Figure 14. *(Left)* Refined prototype for quick feedback on our lid compartments. *(Right)* User interacting with the compartments, using them as a guide to dispose of his trash.

Testing the Waters

How did you test your prototypes? What questions did you ask? How many people engaged in what activities, in what contexts? Describe research methods, sample sizes, data, and interpretation of results. Discuss the limitations of your research methods.

We conducted our prototype tests in two separate contexts, with (1) peers from our class during a prescribed testing period, and (2) members of our target audience in the field. The field context can be further subdivided into the Price Center forum and the Old Student Center. In both contexts, we sought to answer the same broad questions: how did users physically interact with each prototype, and how did they interpret or absorb the information presented to them by the prototype?

In the case of our peers, we were also able to ascertain what users thought and felt during their interactions with the prototypes due to verbal feedback and enthusiastic close observation of our smaller prototypes. A concern particular to our field tests was whether people noticed or studied the prototype and if they chose to interact with the prototype at all.

Our class tests utilized a small-scale prototype in a gamifying context in which users were asked to sort tiny paper cutouts of various waste items into the appropriate receptacle (Fig. 15). Over the course of two sessions, we gathered data from approximately 15 participants, which included our observations of their

performance and the verbal responses they gave to any questions we posed during the test.

Figure 15. Classroom parallel prototype testing.

Our field tests were conducted in the Price Center forum with a nearly full-scale prototype (Fig. 16) from 11:00 AM to approximately 2:00 PM on a weekday, colloquially known as lunch time. We placed our bins in front of two existing trash and recycling bins around lunchtime and over the course of several hours, observed the behaviors of passersby in reaction to our prototype. Data gathering entailed an approximate tally of how many users looked at our prototype and how many used it.

Figure 16. A wild prototype appeared!

We avoided interacting with users as much as possible to prevent influencing them. The Price Center Forum is a very busy area with many people sitting at the nearby tables eating, working, and lounging, and even more people passing through. The prototype's location was meant to reflect a seamless addition to the existing landscape. However, their novelty and their comparatively low fidelity to their University counterparts (Fig. 16) elicited many stares and observable interest. We estimate that approximately 100 people walked by, 51 of who stared at the prototype, expressing intrigue. Nine people attempted to separate their waste appropriately into the prototype receptacles. Ten people used the university bins instead of ours.

The prototype was moved to the Old Student Center at approximately 2:00 PM and it remained there until approximately 5:00 PM. In this context, the effectiveness of the food waste bin on its own was tested. It was placed beside a trash can outside of the Food Co-op. This was considered ideal because the Food Co-op sells tamales that have husks that need to be unwrapped and discarded. Two additional people interacted with the prototype at this location.

After this, the contents in each receptacle was analyzed and evaluated. All the contents of each bin were in the appropriate place. That is, everything in the Recycle prototype was a recyclable, everything in Food Waste was food waste and everything in Landfill was landfill, including coffee cups which are, in fact, largely not recyclable due to the polyethylene lining.

This demonstrates that interacting with the bin covers did make proper waste separation easier for the average person. In this way, the prototype fulfilled convenience. However, the data on incentive and aesthetic is mixed. Of the people that walked by, a large number did find the prototype intriguing but they had no waste to dispose of while they were in the area. Therefore, it is unknown if these same people would have actually used the prototype.

It is also possible that the prototype, with its cardboard covers and short stature, garnered intrigue because of its novelty in the area. This is not the desired intrigue that would necessarily get people to separate their trash diligently. Additionally, some people seemed to notice the prototype and want to use it but their containers were too big for the landfill or recycle bin so they used the large university ones. One person in particular attempted to drop his coffee cup in the landfill bin but it missed the hole and bounced off the lid and he had to go pick it up and drop it in for a smaller height. These variables could be accounted for with taller receptacles and lids made with more industrial materials. But this test mainly sought

to measure the lids' effectiveness at getting people to separate waste. They were indeed effective.

What did you learn from testing your prototypes?

We learned that people are unwilling to take the time to read extra information near trash receptacles and desire assistance when it comes to food waste. These are conclusions that match the characteristics of our target audience. We also learned that the type of information and how it is presented matter in terms of whether or not that information will be salient to the user. We also learned that by presenting situations where users are forced to perform a certain behavior, such as positively constraining users through the trash lids with compartments, users will take the time to sort out their trash and will try to do it to the best of their ability.

We've also learned to pay attention to fidelity. The prototype was novel and that seems to have worked to both attract interaction and repel it. We had limited time, resources and money to build the prototype but if we had more of any of those, we might have been able to build something comparable to current university solutions, or at least a taller prototype. This would have made it more usable and might have changed how willing people were to interact with it.

Conclusion

What did you learn from this class that you can apply to other situations that others might find useful?

Going through the process of data- and user-based design was an eye-opening experience for everyone on the team. This class taught us that good designs do not just happen overnight. They are the culmination of rigorous research, thoughtful testing, and reflective insights performed and tweaked constantly in order to find the most appropriate solution. Good design also must balance feasibility, viability, and desirability to generate the greatest potential for ideas to become reality (IDEO). Design is also not an individual process, but a collaborative process, involving multiple individuals from all different backgrounds and perspectives to bring a diverse set of ideas to the table. Having teams with diverse talents are important in all aspects of work in order to maximize idea generation and come up with the most creative solutions. In regards to the design process specifically, we learned that the process of "failing early and failing often" is crucial to converging to the best possible design solution as it allows for the rapid fruition,

deletion, and iteration of multiple ideas. This enables teams to speedily discard unfeasible, unviable, or undesirable ideas and thus allows teams to quickly determine the ideas with the most potential. For example, throughout our process we ideated broadly, thinking about the entire chain of food waste and methods of targeting each step of the chain, then narrowing down to a specific step to then refine ideas in that area.

While people tend to jump to solutions when tackling problems, it is much better to first take a step back and define the right problem before any other step. This provides a path to dealing with the root of the problem, instead of alleviating only the symptoms of the problem. This applies to not only the design process, but can also be generalized to virtually any problem we face in the world today. Projects do not need to be all-encompassing solutions to problems, but rather, can be reimagined as more progressive stepping stones to larger end-goals. In conclusion, we advise others to approach the problem they are trying to solve with the mindset of wanting to learn rather than to simply solve; it is through this mindset that the actual problem is uncovered and fully understood, leading to a lasting solution for the correct issue.

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