

# Improving Recycling at the University of Arizona: student behavior and attitudes

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## **Abstract**

Waste diversion at higher education institutions in the U.S. remains a growing issue. Recyclable materials that enter landfills have negative environmental impacts as well as expensive landfill service costs for universities. The University of Arizona partnered with a zero waste consulting firm to identify gaps in the current waste management operations by engaging with department head stakeholders, but did not include any form of student engagement. This research targeted the student body to identify ways to improve recycling and zero waste efforts on and around the University of Arizona campus. The research included surveying students about recycling and observations of recycling sites selected by the students. Recommendations were made following the observations and included increasing the amount of recycling bins, ensuring that recycling bins are adjacent to trash cans, standardizing the appearance of recycling bins with the help of labeling, color, and informative graphics, and finally increasing educational opportunities about recycling and zero waste efforts for students at the University of Arizona. Further research should include conducting more student surveys and engaging with the University of Arizona's Office of Sustainability coordinators in charge of the zero waste campus program in order to identify further gaps and improvements in waste management operations.

**Keywords:** recycling, waste diversion, zero waste campus, waste reduction programs

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## **Introduction**

Waste diversion at higher education institutions in the U.S. remains a growing issue. According to Dump and Run, a non-profit environmental organization, it is estimated that the average college student discards 640 pounds of solid waste each year, including 500 disposable cups and 320 pounds of paper (Connecticut Department of Energy and Environmental Protection, 2020). The amount of recyclable materials entering landfills is even more concerning. There are environmental and technical complications that occur when plastic enters landfills, the main issue being the formation and spreading of microplastics into nearby land, water, and air

(Wojnowska-Baryła et al., 2022). Additionally, because of microplastics and their small size, they are quickly and easily transported over long distances, making them prime carriers of pollutants as they travel (Wojnowska-Baryła et al., 2022).

Waste management and reduction efforts aren't just an environmental issue either, but an economic one too. Relying solely on landfills and their services as the only means of waste management can be expensive. Lien Tien King, manager of Campus Recycling and Refuse Services at University of California Berkeley, states that the campus saves almost \$151.47 per ton of waste when recycling instead of relying on landfills (Cockrell, 2012). Increasing recycling services and access can save money for universities, something that should motivate the University of Arizona to do the same.

As concerns for waste levels and associated costs continue to increase, universities and sustainability groups alike are looking for ways to implement waste reduction programs. The University of Arizona is dedicated to becoming a zero waste campus by creating and advocating for educational waste management programs that engage students, in addition to partnering with Post-Landfill Action Network (PLAN) in 2021 to conduct waste management audits with department head stakeholders. While these efforts have provided temporary relief and educational outreach to students, improvements still need to be made to get the University of Arizona to achieve long-term zero waste success. According to the University of Arizona's Office of Sustainability, "UARizona also produced 3227.67 tons of trash in 2020, which is approximately 137.55 pounds of trash per student," (Risser, 2021). In comparison to Arizona State University's waste production, waste produced per person was ~150 pounds, meaning that University of Arizona has achieved minor success in waste reduction efforts (Arizona State University, 2021). These numbers may seem daunting, but they present the University of Arizona and its associated sustainability programs a huge opportunity to engage, educate, and ultimately shape students to be more environmentally conscious of their actions, while inspiring other universities to adopt long term zero waste strategies.

A multifaceted approach to composting and recycling programs on college campuses is an ideal goal to have, however, there are many challenges to overcome when starting or continuing to improve upon these programs. The first approach to implementing a successful waste diversion system starts with waste characterization, or better defined as the practice of measuring the volume of certain types of waste ie. paper, glass, food waste, etc. A study done at

the Prince George Campus of the University of Northern British Columbia shared that paper and paper products, single use beverage containers, and compostable organic materials made up the highest percentage of waste volume on the college campus (Smyth et al., 2010). While these results may not reflect the exact same for the University of Arizona's campus waste characterizations, it is reasonable to assume that they are somewhat reflective of college students' waste streams given the similar demographic age group studied.

What's also worth mentioning is that recycling diversion after the fact is helpful, but how people discard the waste in the first place is what really matters. Educational programs that teach people, specifically students, how to recycle and compost have great benefits. A study done across two campuses, one campus as a control group with no waste diversion program and the other as a campus with a waste diversion program, handed out 660 surveys to identify how educational programs impact students' environmental knowledge. The study found that there was a significant difference between the two campuses sharing that accessibility to recycling and composting programs for students have shown to increase positive attitudes, environmental knowledge, and overall mindfulness towards proper waste diversion efforts (Waliczek et al., 2016). The University of Arizona continues to advertise its environmental groups, including but not limited to Students for Sustainability and Compost Cats, but needs to engage and educate students outside of these groups if they want effective results for reducing and diverting waste on a long term basis and campus wide scale. While it is unrealistic to expect every student at the University of Arizona to be committed and involved with environmental groups, one effective method to improving diversion rates can occur directly at the site of disposal. A study done at the University of Florida looked at the efficacy of signage and messaging at highly frequented public recycling and trash bins. The study found that signage and messaging at these bins increased recycling rates and decreased recycling contamination (Brinton et al., 2022). The University of Arizona can utilize signage and messaging on bins to serve as a quick and efficient way to educate students about recycling while also increasing proper recycling rates.

The benefits of implementing and improving recycling programs at a university wide scale remains critical in advancing waste management and diversion practices as a whole. Educating students on the importance of recycling does impact the way students perceive the environmental benefits of these practices, however, for the sake of this research, what remains to be a question(s) is:

1. How do students at the University of Arizona perceive recycling services on and around campus?
2. What does effective recycling look like to the students of University of Arizona?
3. How can the University of Arizona improve its recycling accessibility on and around campus?

## **Methodology**

Trying to tackle both of these questions meant that the methodology of this research needed to include student opinions and observational verification of the current recycling system in place on and around campus. The first part of this research utilized an online survey created using the program Qualtrics, that surveyed students on their recycling habits, inclination to recycle if there's an informative visual on the bin, accessibility to receptacles on and around campus, opinions on where improvements can be made, opinions on what sites already have satisfactory recycling in place, and what they would change about recycling at the University of Arizona if they had the power. An important aspect of this survey was to gather participants from diverse educational backgrounds (different majors) and participants who aren't currently involved in any environmental support groups on campus such as Compost Cats and Students for Sustainability. Surveying selected students with diverse backgrounds and no affiliation with environmental groups and observing their responses is important because they have an unbiased view on recycling access and services on campus and can direct the eyes of research in the right direction toward satisfactory and unsatisfactory recycling areas. The survey was sent via email and text message to 50 student participants and included free response options to ensure that student's opinions were not limited or influenced by providing multiple choice answers.

After receiving responses from a total of 23 participants, the results were then analyzed for any thematic responses pertaining to what sites on and around campus students feel either have effective recycling or need improvement. Of the responses given, the two most commonly chosen places for improvement and satisfactory recycling, Main Gate Square and the Student Union Dining Hall, were then observed for further investigation. Additional observational data was gathered at Arizona Sonora Dormitory due to it being student housing managed and operated by the University. As a disclosure, the survey strictly asked students questions

pertaining to the study site, the University of Arizona campus, however, it was noted that the responses did not fully indicate areas within the chosen study site and adjustments were made to include these areas within the research study site. This is because by observing areas with or without recycling access that students feel need improvement or appreciation, recommendations can then be made to the University of Arizona on how they can standardize recycling receptacles on and around campus for maximum efficacy and accessibility.

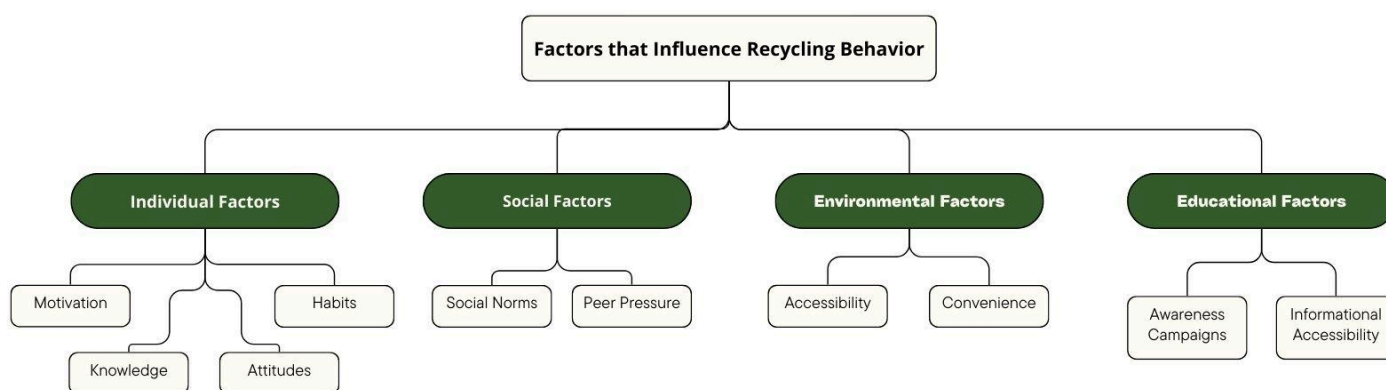


Figure 1: Identified factors that can influence recycling behavior of students (Waliczek et al., 2016; Brinton et al., 2022).

The identified factors above play a major role in how student’s recycling behavior can be altered depending on the individual themselves, their social environment, their physical environment, as well as their educational background. It is important to note that each of these factors can positively or negatively affect the users ability to recycle properly on a given day.

## Results

The results from the survey highlighted a lot of common themes about how students perceive recycling at the University of Arizona. The identified factors from the survey that influence a student’s willingness to recycle include the location of the bin, the amount of bins present, and overall appearance of the recycling bin. Ultimately, these factors can influence how “accessible” a recycling

bin actually is and its effectiveness in getting students to recycle properly.

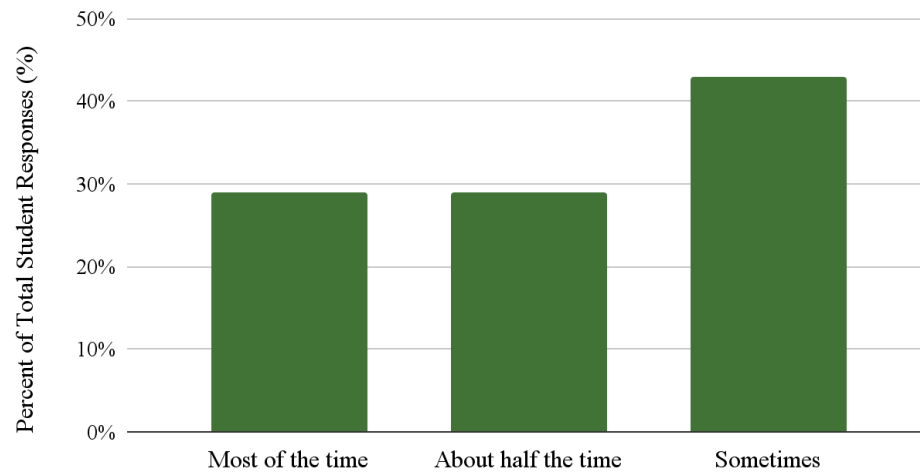


Figure 2: How often students recycle on campus

Regarding recycling habits, the majority of student respondents stated that they recycle sometimes (43%) when they're on campus, while the rest stated that they recycle either most or half of the time (29%).

The students were shown Figure 3, an informative graphic detailing what can and cannot be recycled and asked if it would affect their recycling behavior.



Figure 3: Informative graphic shown to students (Image source: Rushmoor Borough Council).

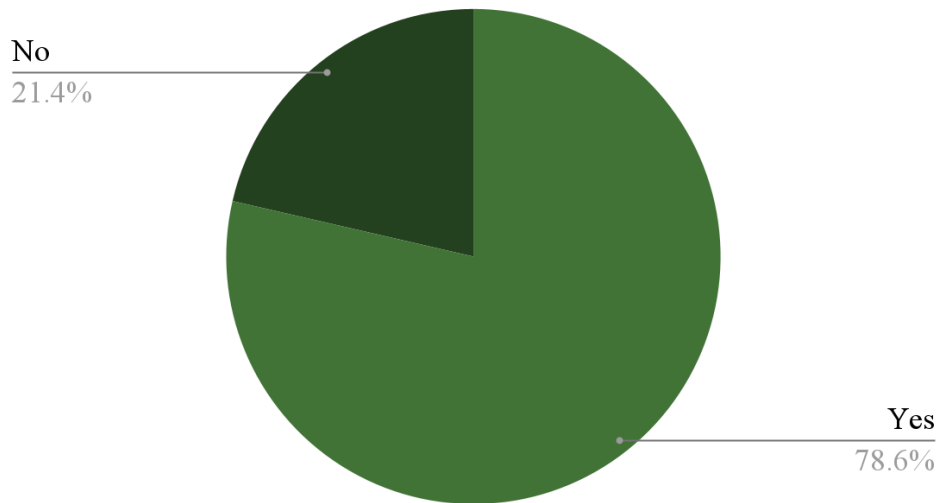


Figure 4: Students asked "Would the image above affect your recycling behavior?"

Majority of the students stated that they would be affected positively by an informative graphic similar to Figure 3 if it were present on a bin while they're recycling. Students stated that having an informative graphic would help them know the specifics of what can and cannot be recycled, especially because recycling services differ across locations in terms of what type of recyclables are accepted. This would also ultimately prevent further contamination caused by users. Additionally, students were asked how they feel about locating recycling bins on campus and the results are shown in Figure 5. Majority of the student respondents stated that it is somewhat difficult to locate recycling bins on campus (43%). While students did not disclose why it can be difficult to locate recycling on campus, it could be due to the fact that recycling bin access across campus is not dispersed evenly.

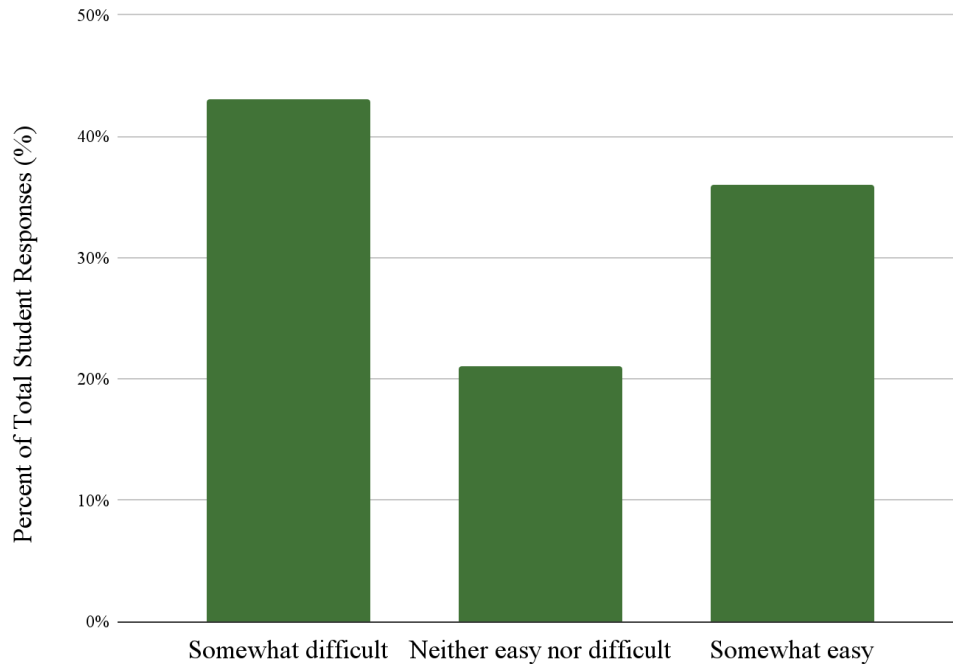


Figure 5: Students were asked "Is it easy for you to locate recycling bins on campus?"

Finally, students were asked to share recommendations they would implement if they had the power to change it. The results are displayed in Figure 6 below. The majority of students stated that they would first and foremost increase the amount of recycling bins on and around campus (44.4%). Students also stated that they would clarify what can and cannot be recycled on the recycling bins with informative graphics (18.5%). Additionally, student respondents stated that they would standardize the look of recycling bins by ensuring that they're labeled and blue so they can be easily differentiated from trash bins (14.8%). Other responses from students indicated that they would implement glass drop off incentives on campus since glass isn't accepted at standard recycling bins across Tucson (11.1%). The remaining responses stated that they would add rinsing stations for recyclable plastics next to recycling bins in order to reduce food and beverage contamination from entering the bins (11.1%).

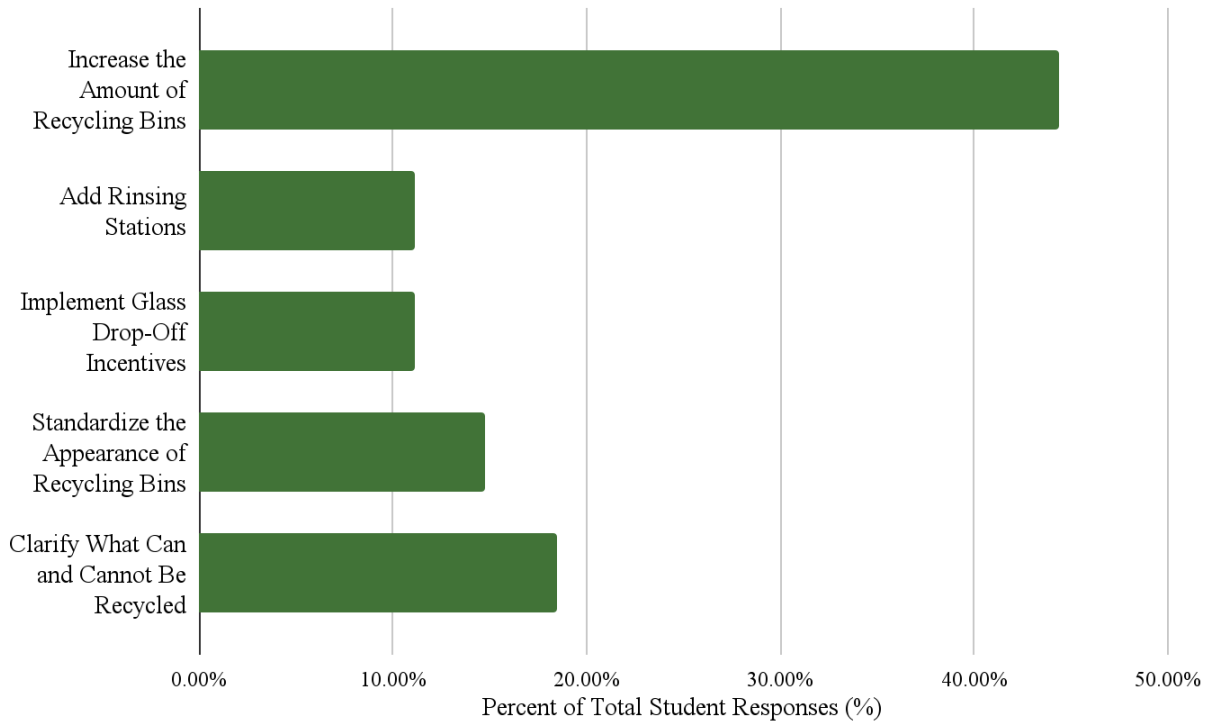


Figure 6: Student recommendations for improving recycling at the University of Arizona

The results from the survey indicated that 73% of students think Main Gate Square (MGS) has suboptimal recycling access while 67% of students think that the Student Union Dining Hall (SUDH) has satisfactory recycling access. From these responses, both of these sites were selected as areas for observation in addition to the Arizona Sonora Dormitory (AZ/SO), since it is a student housing building managed by the University of Arizona and located on campus.

AZ/SO was the first observation site and featured only one recycling location outside of the dorm building, shown in Figure 7 below. The recycling bins and the surrounding area did not dictate what could or could not be recycled and it was observed that there were non-recyclable items in the recycling bins.



Figure 7: Recycling area at AZ/SO dormitory (Image taken by Bethany Gammariello).

The next observation site was the SUDH, which featured several recycling bins as well as a Zero Waste Station (ZWS) shown in Figure 8. However, recycling bins were outnumbered by trash bins by about 2.75 times. Additionally, none of the recycling bins had a standardized look in terms of size and color. Each bin was labeled but did not detail what could or could not be recycled, except for the recycling bin located at the ZWS.



Figure 8: ZWS at the SUDH (Image taken by Bethany Gammariello).

The final observation site was MGS located on University Boulevard next to campus. There is no recycling access along the street or sidewalk. There is one recycling bin (Figure 9) located on the Sun Link Streetcar platform, but is inaccessible due it being half the size of the bin as well as facing a pole. In total, there are 15 trash bins, however, they are unevenly dispersed along both the North and South sidewalks. The North sidewalk has 10 trash bins while the South sidewalk only has four trash bins. The bins do not have any labeling and are all black.



Figure 9: Half trash/half recycling bin at Sun Link platform at MGS (Image taken by Bethany Gammariello).

## Discussion

Based on the results of the survey responses and observations, there are several improvements that can be made to improve recycling at the University of Arizona campus as well as locations near the campus. These improvements can be broken down into five steps shown in Figure 10.



Figure 10: Recommendation steps for improving recycling at the University of Arizona

The first suggestion is that the amount of recycling bins on campus needs to be increased by following a 1:1 ratio, meaning that for every available trash bin in a given space, a recycling bin should be available as well. This will increase accessibility for recycling in areas with no current recycling and reduce the amount of students who find it difficult to locate recycling on or around campus. Areas with little to no recycling access should be prioritized, MGS being one of those locations. Additionally, location of recycling bins is crucial in affecting a user's inclination to recycle. Physical environment affects a user's inclination to recycle, as shown in Figure 1 and the literature discussed prior. Placing a recycling bin adjacent to the trash bin will be a reminder for users to think about the items they are about to discard and if they're recyclable or not. The next step to improving recycling is standardizing the appearance of recycling bins especially if they are next to trash bins. Recycling bins should be labeled and blue so they don't create confusion and can be easily differentiated by users. Having engaging colors and labels on recycling bins can increase user recycling rates (Szcucinski et al., 2020). Based on the observations, the majority of recycling bins are labeled but should be further differentiated with color. Furthermore, by adding informative graphics that display and encourage users to dispose of their items properly, the risk of contamination

can be reduced while also increasing recycling diversion rates (Brinton et al., 2022). The final recommendation to improve recycling at the University of Arizona is to increase student engagement and education about recycling and waste diversion tactics on campus. User knowledge and attitudes are factors that can affect one's recycling behavior, but by increasing student engagement and awareness of sustainability clubs, programs, and other initiatives that target waste reduction, students and other users will be inclined to recycle properly (Waliczek et al., 2016).

## **Conclusion**

In order for the University of Arizona to achieve long term zero waste success, improvements must be made to the current recycling bins on and around campus as well as increasing student engagement with zero waste programs. Student engagement is critical for improving waste reduction, especially since they are the main contributors to the University's waste stream. Limitations of this study include that while the recommendations given by students (23 responses) are helpful, they cannot be generalized and representative of the entire student body opinion. While this study did target student opinion as the main methodology source, interviews with the Office of Sustainability and the head coordinators of waste management were not included, limiting the available information on the current and next steps of the University of Arizona's zero waste auditing program. Further research should include additional surveys to capture the entire student body opinion and interviews with the University of Arizona's Office of Sustainability head coordinators of the built environment and waste management departments.

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