Penn Student Eco-Reps partnered with faculty, staff, and students at Nursing to create a recycling awareness campaign to educate and refresh proper recycling practices for the occupants of Fagin Hall. This project began with a preliminary waste audit to assess the current level of recycling practices within Fagin Hall. After reviewing and analyzing the results, ideas about how to communicate effectively with the Nursing community about proper recycling practices were generated. These ideas included conducting a survey, designing messages containing recycling tips and sending them out to the nursing students via email and displaying them on monitors around Fagin Hall, creating and distributing laptop stickers containing our campaign name and logo, and creating a mural in one of the building’s stairwells featuring the campaign name, logo, and ideas associated with proper recycling practices. The waste audit and survey were used to quantitatively assess the current level of understanding of proper recycling habits and to look for areas of potential improvement. The messages and screensavers were used to disseminate recycling information and educate students in Fagin Hall, the laptop stickers were used to spread awareness for the campaign, and the mural was used to educate students and to serve as a reminder.

The goals of this campaign included creating and disseminating campaign education materials, creating and using a survey to assess current understanding of recycling, and conducting pre- and post-campaign waste audits to assess the campaign’s effectiveness. We sought to effectively communicate proper recycling habits to Penn Nursing students through a variety of media. We based the contents of our communications on the results of the preliminary waste audit and the pre-campaign survey. We then used the data gathered from the post-campaign waste audit and compared it to that from the preliminary audit to measure the success of our campaign. Our goal was to reduce the amount of waste that was disposed of in the incorrect bins. We used metrics such as diversion rates, real recycling rates, and contamination rates to determine whether this goal was met. Specifically, we looked at the difference between the diversion rates and the real recycling rates, the contamination rates, and considered the volume of the total waste when evaluating the success of our campaign.
Research Findings:

Our preliminary waste audit was conducted on November 8, 2017, as a means to quantitatively assess which areas of Fagin Hall were to be designated as our areas of focus. The following table summarizes the results from our waste audit:

<table>
<thead>
<tr>
<th>Location</th>
<th>Total Weight of Waste (lb)</th>
<th>Diversion Rate - Real Recycling Rate (DR-RRR)</th>
<th>Contamination Rate (CR)</th>
<th>DR-RRR Ranking</th>
<th>CR Ranking</th>
<th>Total</th>
<th>Final Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auditorium</td>
<td>7.25</td>
<td>8.97%</td>
<td>22%</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Cafe</td>
<td>5.9</td>
<td>5.93%</td>
<td>14.3%</td>
<td>4</td>
<td>7</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>118 North</td>
<td>4.5</td>
<td>10%</td>
<td>28.1%</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>118 South</td>
<td>2.65</td>
<td>9.43%</td>
<td>26.3%</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>218 North</td>
<td>4.9</td>
<td>3.06%</td>
<td>27.3%</td>
<td>7</td>
<td>3</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>218 South</td>
<td>4.55</td>
<td>5.49%</td>
<td>25%</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>3rd Kitchen</td>
<td>0.95</td>
<td>0%</td>
<td>0%</td>
<td>8</td>
<td>8</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>4th Kitchen</td>
<td>3.4</td>
<td>4.41%</td>
<td>33.3%</td>
<td>6</td>
<td>1</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 1: Summary of Results from preliminary waste audit

The diversion rate (DR) is simply the weight of the recycling waste divided by the weight of the total waste (recycling and trash). The real recycling rate (RRR) is the weight of the recyclable items that were correctly disposed in the recycling bin divided by the weight of the total waste. The difference between the two (DR-RRR) is therefore the weight of trash (non-recyclable) that was incorrectly disposed of in the recycling bin divided by the weight of the total waste. The bins located outside of the north and south entrances of classroom 118 had the highest DR-RRR.

The contamination rate (CR) measures the weight percentage of non-recyclable items that were incorrectly disposed of in the recycling bin. The bins in the fourth floor kitchen had the highest CR, followed by the bins located outside of the north entrance of classroom 118.

For the purposes of this campaign, the data collected from the third and fourth floor kitchens, which are primarily used by faculty members only, was disregarded, but included here for the sake of completeness. Thus, our primary areas of focus were classroom 118 (both entrances), the auditorium, and classroom 218 (both entrances). The cafe surprisingly had the lowest CR and
the second lowest DR-RRR, which we concluded to be due to the abundance of signs surrounding the waste bins outside of the cafe.

The bins that were audited were ranked from worst (1) to best (8) on both DR-RRR and CR. These rankings were then added, and final rankings were assigned, with 1 being first priority. Again, the data from the third and fourth floor kitchens were disregarded, so our three major areas of focus were classroom 118, the auditorium, and classroom 218, in that order.

On Friday, March 16, 2018, a survey on recycling habits was sent out to the nursing students. The survey, which had 235 responses, asked students how frequently they visited Fagin Hall, whether or not they believed the trash and recycling receptacles were easily accessible and clearly labeled, and which common items they already knew were either recyclable or non-recyclable. 50.6% of students who filled out the survey said they visit Fagin Hall daily. 78.3% of students said they found the trash and recycling receptacles to be easily accessible, and 79.4% of students said they found the trash and recycling receptacles to be clearly labeled. Figure 1 shows the results of which items students knew are recyclable, and Figure 2 shows the results of which items students knew are not recyclable.

Figure 1: Survey results on knowledge of common recyclable items
Methodology:

Our project began with a preliminary waste audit from which we gathered data that we used to assess the current level of recycling practices within Fagin Hall. We also used the data to determine our primary areas of focus in Fagin Hall and who our primary target audience is. Because the bins outside of the classrooms and auditoriums generally had the largest volumes and highest DR-RRR and CR, we determined these to be our primary areas of focus, disregarding the data gathered from the bins on the third and fourth floor kitchens. We also determined that our target audience is the students, both nursing and non-nursing students, who use Fagin Hall.

Having determined our target audience, we thought about how to effectively communicate proper recycling practices to the students. As part of our campaign, which took place from March 19 - April 6, 2018, spanning three weeks, we decided to create weekly-themed messages that were distributed to the students via email. As a supplement to this, we displayed these messages as screensavers on the monitors around Fagin Hall throughout the duration of our campaign. Another medium of dissemination that we used was laptop stickers containing our campaign name and logo throughout the duration of our campaign. Lastly, we created a mural in one of the building’s stairwells featuring the campaign name, logo, and ideas associated with proper recycling practices.

Prior to the start of our campaign, we distributed a survey to supplement our waste audit data and to determine areas of focus for our weekly messages. We decided on “Recyclables are too good to waste!” for week one, “Pull apart your trash” for week two, and “When in doubt, throw
it out!” for week three as our messages for the campaign. Week one included informing students about which parts of a coffee cup are recyclable, and which parts are not. A message from the first week of our campaign is shown in Figure 3. Week two included informing students about the importance of separating trash and recyclable items from one another and disposing of them accordingly. This message is shown in Figure 4. The last message of our campaign, “When in doubt, throw it out,” primarily emphasized the reduction of contamination rates. Week three focused on the results of question five from the survey (Figure 2)—minimizing disposal of non-recyclable items in the recycling bin (such as coffee cups). The success of the reception of these messages was based on the results from the post-campaign waste audit and its comparison to that of the preliminary waste audit.

![The Anatomy of a Coffee Cup](image)

Figure 3: Message from first week of campaign
Recycling doesn't work unless you do.

Pull apart your trash.

Figure 4: Message from second week of campaign

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⚠️ CAUTION

WHEN IN DOUBT, THROW IT OUT

IF YOU'RE UNSURE IF AN ITEM IS RECYCLABLE, THROW IT IN THE TRASH.

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Figure 5: Message from third week of campaign
## Results and Evaluation:

The results of our post-campaign waste audit, which was conducted on April 16, 2018, are summarized in the table below:

<table>
<thead>
<tr>
<th>Location</th>
<th>Total Weight of Waste (lb)</th>
<th>DR-RRR</th>
<th>CR</th>
<th>DR-RRR Ranking</th>
<th>CR Ranking</th>
<th>Total</th>
<th>Final Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>118 North</td>
<td>2.3</td>
<td>0%</td>
<td>0%</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>118 South</td>
<td>3.7</td>
<td>3.51%</td>
<td>33.3%</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>218 North</td>
<td>1.77</td>
<td>17.5%</td>
<td>50%</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>218 South</td>
<td>1.81</td>
<td>7.18%</td>
<td>24.5%</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 2: Summary of results from post-campaign waste audit

A waste audit was not conducted for the bins in the third and fourth floor kitchens, nor the cafe, as these bins were not major areas of focus, as concluded from the preliminary waste audit. A waste audit was conducted for the auditorium, however, but an event that occurred prior to the waste audit being conducted resulted in the bins being moved and separated from one another, thus skewing the data that was collected and rendering it unusable. It is therefore not included in the table above.

When comparing the results of Table 2 with that of Table 1, it is clear that the data that was collected from the post-campaign waste audit is inconclusive. The 118 and 218 North bins had exceedingly extreme DR-RRR and CR, and for the purposes of this study, may be discarded as well. The DR-RRR for 118 South decreased and the CR increased, while the DR-RRR for 218 South increased and the CR decreased. Of note is that for all of the data that was collected from the post-campaign waste audit, the total weight of waste was significantly lower than that from the preliminary waste audit, making it difficult to compare metrics such as DR-RRR and CR accurately. Thus, the data that was collected is inconclusive. Anecdotally, however, it became almost immediately apparent that there was a greater effort by students to separate their waste, with the coffee cup being the prime example of this. One of the recycling bins outside of 118 North, for example, contained only a coffee cup lid and sleeve, which resulted in a 0% DR-RRR and CR for that bin, and also the data from this bin being unusable.

The campaign’s success can best be measured by the campaign itself—not the waste audit data. This includes the campaign’s messages and their reception and impact on the students. The survey, screensavers, and laptop stickers all proved to be successful in promoting the campaign and furthering its cause.
Recommendations for Future Projects:

As mentioned previously, the success of our campaign was difficult to measure by waste audit data alone. To correct this, for future projects, a “pre-campaign waste audit” is recommended. This data can be a valuable tool in learning about the effects of the campaign itself as it is likely to be more accurate and thus be used to compare to the post-waste audit data that is collected. When learning about the patterns of a new building, it can be daunting to begin a project without first gauging a current level of understanding of good recycling practices, so a preliminary waste audit is still recommended. Its data should not be interpreted too closely, but rather used as a general guidance tool for beginning the project.

Another recommendation for future projects is a longer, more directed campaign. Our campaign focused on general goals, such as reducing the DR-RRR and CR, but a campaign with more specific goals can perhaps have a greater impact. For example, a campaign that promotes the use of reusable water bottles as opposed to plastic water bottles can be extremely impactful in reducing the amount of plastic waste that is generated, and this metric can more easily be measured. There are also potential benefits to running a longer campaign; originally, our campaign was scheduled to run for four weeks, but was reduced to three due to time constraints. Obviously, there are both pros and cons to shorter and longer campaigns, so the length of the campaign should be varied, depending on the amount of time that the specific project might deem to be necessary. In the example given above, the length of such a campaign can run from a week to a semester, depending on the type of project and the goal of the impact.

Lastly, in both the preliminary and post-campaign waste audits that were conducted, a significant amount of food waste was observed. This recurring pattern has sparked the idea for compostable food waste to become mainstream on campus. As of now, a pilot is in place, and hopefully, the success of this pilot can lead to the growth of compostable food waste disposal areas on campus, so that they are more accessible and convenient to students, faculty, and staff. Implementing a large-scale compostable food waste program on campus can have enormous impacts on reducing the amount of food waste that is sent to landfill.