Designing A Research Study on ECU's Recycling Habits Through Prototyping, Pivoting, and Failing

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A. HNRS 2000: Ideation

I. Designing Your Life

The HNRS 2000 course began by asking students to read *Designing Your Life* to understand the basic flow of design thinking and complete a series of exercises revolving around our personal lives. *Designing Your Life* also introduced ideas behind human-centered design, a design model that considers the human experience in every step of development. Over the next few weeks of the class, we transitioned skills from *Designing Your Life* to designing solutions for real-world problems.

II. Wicked Problem

The HNRS 2000 course separated students into small groups and tasked students with the challenge of finding a "wicked problem" to solve. Wicked problems are problems in our communities that feel impossible to solve and come with a multitude of societal, financial, behavioral, and emotional ramifications in their solutions. Human-centered design is the ideal model for solving wicked problems because it attempts to mitigate the consequences of wicked problem solutions by considering human needs in every step of the process. Prior to our first class, the incoming Honors College freshmen filled out a survey ranking different wicked problems in order of interest to us. Our HNRS 2000 team was originally chosen to continue a previous HNRS 2000 group project that worked with a local pharmaceutical company, ThermoFisher. The goal of their project was to reduce pharmaceutical waste. Since there was no access to the previous work done by that HNRS 2000 group, we decided to observe ECU's campus to find possible wicked problems to work towards solving for our own Signature Honors Project. Ultimately, our original team shared a passion for science, nature, and sustainability, so

our brainstorming sessions consisted of ideas that revolved around campus waste, litter, and facility practices.

III. Interviewing and Prototyping

After weeks of brainstorming, our team decided to focus our efforts on recycling at ECU. To kickstart our research, we each conducted multiple interviews with fellow Honors College students and found that people were uneducated about how to recycle at ECU. Numerous interviewees voiced their uncertainties about what could and could not be recycled and said they had no idea where to find correct information about ECU's recycling program. Therefore, our team decided to develop educational signage to be affixed to campus recycling bins detailing what can and cannot be recycled. Ultimately, the signage idea never reached the prototype phase. Our team decided that signage is often overlooked, unclear, and would not be the best method to effectively solve our wicked problem of educating ECU's population about recycling.

After the signage failure, one of our original team members, D'Angelo Harris, documented the aftermath of an ECU football game. Tailgaters had littered cans, bottles, bags, and containers across an entire parking lot. Many of the littered materials in the photographs could have been recycled but had to be disposed of as waste. Based on this new evidence, our team decided to pivot towards promoting more effective and efficient recycling at ECU.

As a result of the ideation process, our team developed a prototype to attempt to solve the wicked problem of poor recycling on ECU's campus. We decided to propose a waste audit on ECU's campus recycling bins to determine if campus frequenters were recycling effectively. The goal of the proposed audit was to collect baseline data to see if campus recycling was as poor as the football litter aftermath appeared to be.

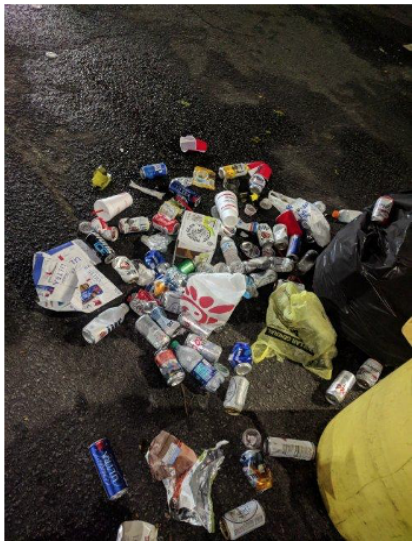

Figure 1: Image of tailgater litter captured by D'Angelo Harris

IV. Poster Session and Rankings

At the conclusion of HNRS 2000, our original six-person team created a research poster and presented our semester's findings at the HNRS 2000 Poster Session. We discussed the pivot from signage to audits, football litter photographs, interview data, and our potential plans for HNRS 3000. After the Poster Session, all students in the class ranked their favorite projects to decide which ideas would move on to HNRS 3000. Our team's ideas were very promising and we were selected to move onto HNRS 3000 to continue our research and perform our proposed waste audit.

B. HNRS 3000: Research

I. Prototype Planning

Students from failed HNRS 2000 groups joined our sustainability research group, greatly increasing our group size and dynamic. The original leaders of our group, Mattie and Caroline, became familiar with the new members and began to delegate responsibilities between group

members. Our group began to outline a set of objectives and create a loose plan for what we hoped to accomplish during the remainder of HNRS 3000. Interviews were conducted with ECU's sustainability management team which gave us more insight into sustainability issues; additionally, interviews with organizations from various colleges, such as Boston College and University of North Carolina Wilmington, led us to discuss the feasibility and logistics of our proposed waste audit idea. These interviews allowed our group to establish permanent relationships with ECU staff members who would soon become our project advisors. Filled with their expertise and knowledge of ECU's current recycling efforts on campus, Chad Carwein, ECU's sustainability manager, and Terry Little, ECU's recycling coordinator, were crucial in advancing our group and future research.

Originally, our group wanted to conduct a public audit to attract passing students, visitors, and faculty and possibly provide immediate education about proper disposal and recycling methods. However, ECU's Environmental Health and Safety team expressed concerns over this idea due to possible health hazards. In addition, campus officials did not understand the purpose and projected impact of this research and may have mistaken our proposed public audit as a defacement of ECU's property. While brainstorming and ideating possible pivots to ensure that a public audit to be executed with all avenues of safety considered, ultimately campus officials did not want to risk creating an ironically "dirty" reputation. At this point, with the help of Terry Little, we pivoted and chose a new, more private location at the facility behind C-Lot.

After the audit location was established, we had to determine which of ECU's buildings we would survey for this audit. Ultimately, we came to the conclusion that the Main Campus Student Center would give us the best insight on ECU's recycling habits as a whole. Both on and off-campus students visit this area as well as faculty, staff, and visitors, which represents ECU's

population as a whole. We also chose this location as there was directional signage on the trash and recycling bins in this building and would give us insight on the effectiveness of the signage.

The last things to plan prior to the audit were the protocols and schedules for that day. To align with environmental safety guidelines, certain protocols were established to ensure that our group conducted the audit in the safest manner. Each member of our group had to submit vaccination records with current Hepatitis-C and Tetanus shots and give consent to perform this audit on campus. We also had to abide by a dress-code on the day of the audit and wear hazmat suits, gloves, goggles, and close-toed shoes.

II. Prototype Execution and Data Analyzation

Weeks prior to the end of the spring semester, we iterated our prototype and hosted ECU's first trash audit. This was our big event for the HNRS 2000 and 3000 cycle. We collected both waste and recycling samples from the Main Campus Student Center post-lunch time and transported it to the audit location. The audit was performed in accordance with the environmental safety guidelines and a member of Environmental Health and Safety was present to supervise the entire process. We combined all of the recycling bin's contents together and separated them by recyclables, non-recyclables, and compostable material. Afterwards, each category was weighed to give us quantitative data of the quality of the recycling stream.

After analyzing the collected data, it was found that 36.4% (80.0 lbs) of all the material collected were recyclable material, 13.6% (30.0 lbs) was compostable material, and 50% (110.0 lbs) was trash which included contaminated recyclable items.

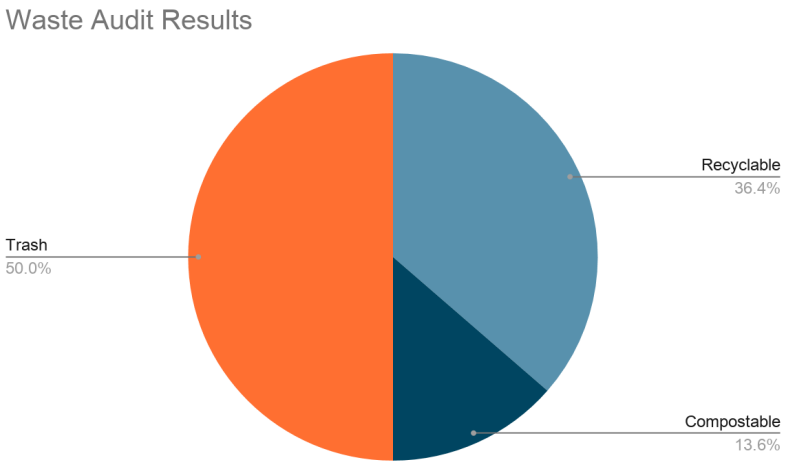

Figure 2: Pie chart distribution of trash, recyclables, and compostables from the Main Campus Student Center waste audit.

While the data we obtained gave us basic insight into the Main Campus Student Center's recycling stream, our team failed to collect satisfactory information. HNRS 3000 Colloquium Professors expressed concern that our audit data was not as insightful as it could have been. They suggested that we could have been more specific on the identities of recyclables and nonrecyclables and focused on specific types of contamination to acquire more statistics. Despite our insufficient data, our group considered our failure a success due to the lessons learned which would later help guide our future plans and research. The first audit also gave us our first experience with primary data collection and analysis alongside learning more about environmental health and safety regulations regarding this type of research.

III. Earth Day Data Presentation

We analyzed our findings and planned to present the data at ECU's Earth Day event hosted by ECU Sustainability. Through previous experience, our group decided that it would be best if the data presentations were interactive. Collectively, our group came up with the game of

Trashketball. Originally, the idea was that the bypasser would be handed a commonly mistaken recycling item of the Main Campus Student Center, such as a Panda Express Bowl, Starbucks cup, or Raising Canes plate. Then the person would be presented with two bins, one trash and one recycling, and would have to decide which bin the item belonged in and shoot it in like a basketball. However, we pivoted to accommodate for possible winds and decided that the bypasser would just be presented an item and handed a basketball to shoot into the correct bin. Stickers were designed by group member Zachary Pakulniewicz to hand out to bypassers to serve as association reminders with our tabling event. We were also generously donated freebies such as recycled notebooks, reusable utensils, and other sustainable items from ECU Recycling and ECU Sustainability offices to disperse during our event.

IV. Final Thoughts and Moving Forward

The data allowed us to petition Panda Express and Raising Cane's to change the plastic materials they sold. Ultimately, this proved unsuccessful. As we communicated with higher, more important officials, the less receptive these large companies were to change. Despite this failure, the audit was a success overall and helped solidify our relationship with the ECU Sustainability staff. The audit also indicated which group members were passionate about the project enough to continue onto HNRS 4500. Mattie, Caroline, Emily, and Marco also joined Will in ECU's ECO-Pirates Sustainability Club to work together beyond the project. This propelled us into official leadership roles and allowed us to recruit other like-minded individuals who wanted to improve sustainability on campus. We attended the ECU officer leadership workshop to learn more about the resources available to us as officers, as well as tips to effectively lead.

Five of the fourteen HNRS 3000 members moved onward to HNRS 4500 and 4550. After the removal of uninterested group members, this tight-knit group was able to continue sustainability research and work more efficiently as a team. As we began to develop our leadership skills, we completed our final presentation for HNRS 3000 and began looking forward to continuing the project as sophomores in HNRS 4500.

C. HNRS 4500: Protype

I. Assembling the Proper Team

Our team, "Sustainability at ECU," began HNRS 4500 with a thorough and well-developed plan for possible experiments and methods for increasing sustainability on campus. We assigned each group member specific roles which helped maintain effective communication, organization, and teamwork throughout the fall semester. The main goal we aimed to accomplish throughout this course was to develop a research project for the spring semester involving the campus recycling bins. Our relationships with ECU's Recycling Coordinator, Terry Little, and ECU's Sustainability Manager, Chad Carwein, was significant in propelling our efforts forward and planning a successful project. Frequent meetings with Terry Little and Chad Carwein allowed our group to learn about ECU's specific sustainability issues regarding excessive waste and recycling production. Despite the concerning results of our HNRS 3000 audit, neither ECU nor students took significant action in attempting to reduce waste. Therefore, our group decided to focus our next project on recyclables only and whether the color of the bins would influence recycling rates on campus.

II. Prototyping A More Niche Sustainability Avenue at ECU

We held more weekly meetings with Terry Little and Chad Carwein regarding the materials we would need, how to approach the issue, and where on campus our experiment should take place to survey the influence of recycling bin color on recycling contamination. Initially, ECU management was opposed to this research as they saw it as an extra expense; furthermore, if the collected data supported the addition of blue or green bins, this would imply repainting every outdoor recycling bin on campus. However, through persistence and compromise, we were granted permission to execute this research as our end goal was to ultimately collect data for informational purposes. One compromise made was that the different colored bins had to be made from the same manufacturer as the current purple outdoor recycling bins and that the signage would stay the same: purple writing and white background. After contacting Jeff Hasley, ECU's Bin Vendor of Victor Stanley, he applauded our sustainability efforts and generously donated one blue and one green bin, with ECU's signage, to be used for research. The other compromise was location. Initially, we wanted a high-trafficked area on campus such as Sonic Plaza or Wright Plaza. However, facility management limited our location options and we chose the Recreation Center Bus Stop. Throughout the remainder of the fall semester, our group outlined a detailed schedule for the spring in order for our project to be informative and successful. By the end of HNRS 4500, our group's recycling bin experiment was developed and ready to be implemented on ECU's campus.

Figure 3: The green, blue, and purple bins used in the recycling audit experiment.

D. HNRS 4550: The Unexpected Pivot

I. Adapting to COVID-19 Restrictions

After the unfortunate shutdown and evacuation of campus due to the COVID-19 pandemic, our research and audits came to an abrupt and unexpected halt. The only option forward was something all too familiar to us – a pivot. As we were still missing data for the last audits, we were unable to properly formulate and assess our final results. Instead, we decided to turn our research efforts to learning about COVID-19's Impact on Recycling. We found out that almost immediately following the lockdown in March of 2020 – by the second week - many cities noticed a tremendous increase in overall waste, and specifically recycling tonnage, most likely due to more citizens staying at home. Wake County, N.C. alone experienced a 45% increase in cardboard recycling and a 20% increase in mixed recycling (88 and 253 tons respectively.)[1]

At first, this seemed like a good thing – of course there's more residential waste overall, but people seem to still be conscious about their recycling habits. However, after further

research, we discovered an unfortunate truth. Since stricter protocol had to be implemented for recycling management, most of these recycling efforts did not seem to pay off. The most popular protocol change being made, and probably the worst, was for all recycling to be sent directly to the landfill. Nearly 30% of waste industries employed this policy. Other changes were also unfortunately negative, such as minimal to no sorting of recycled material, or no collection of recycling altogether.[1]

Figure 4: Common protocol changes made by waste industries after the pandemic.[2]

II. Presentations

The final step to complete the Signature Honors Project was the presentation of our research. Initially, in the spring semester of 2020, we were scheduled to present our data at Research and Creative Achievement Week. However due to the unexpected global shutdown, this event and the rest of the in-person semester was cancelled.

Instead, the team presented their research at the Pre-Professional Virtual Research Symposium and to the members of ECO-Pirates and Re-Leaf. Our data did not indicate that a presentation to ECU's administration to advocate for change would be effective, so we chose to present to a professional audience and club audience. The professional audience presentation

allowed our team to refine our professional presentation skills and the club member audience provided an event to renew interest in two environmentally-oriented clubs at ECU.

Personal Reflection

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