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Mobile Fixer Studio: How to repair one item at a time on campus

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Abstract: The belongings at the Arizona State University (ASU) residence halls often have a short lifespan. At the end of each year, dumpsters around campus fill up with discarded personal items, many of which are still in good condition. Despite the efforts of ASU's Zero Waste Initiative to mitigate this issue, the systematic barriers of municipal infrastructure in waste sorting and recycling significantly limit progress. In addition, students often face challenges with practical repair skills, limited resources, and perceived obsolescence. Initial research conducted by the PI of this study through campus-based repair workshops supported the concept of prioritizing repair and offered a potential change of course for personal belongings. This paper explores the conceptualization and implementation of a mobile repair station based on the university's campus through a collaborative case study on the accessibility of repair tools and education on repair techniques. The convergence of campus-based repair initiatives, with the accessibility of a mobile repair station, seeks to cultivate a culture of conscientious consumption amongst the campus community.

Introduction

The circular economy is advocated as an environmental solution by reintegrating discarded materials and products into production and consumption cycles to minimize waste (D'Urzo & Campagnaro, 2023). The circular economy concept, prioritizing repair over recycling, offers tremendous potential for shaping consumer behavior. However, the prevailing focus has primarily centered on material recycling, sidelining the advantages of repair and reusing (Bracquene et al., 2018). Historically, repairing was the standard solution for broken products, but globalization and planned obsolescence undermined this practice (Chapman, 2021).

Fischer (2013) points out a time when fixing everything was standard, in stark contrast to today's disposable culture. In recent times, there has been a surge in the repair of everyday items, fostering social interaction and community bonding (Mattern, 2018). The resurgence of repair gains momentum from trends such as fixer-upper shows and the call for self-sufficiency during the COVID-19 pandemic, positioning repair as a bridge to resilience and sustainability. Scholars studying product life cycles, sustainable consumption, and the circular economy have unearthed layers of repair activities (Goldmark, 2020; Wackman&Knight, 2020). The comeback of repair is exemplified by the global spread of repair cafes and initiatives (Wackman&Knight, 2020), such as The Levi's Tailor Shop and Patagonia, marking the rise of circular design strategies. Repair cafes and innovative service providers, such as Re-Action Collective and Menddie, signify the emergence of repair-centered ecosystems. Repair cafes now serve as public education and connection stations to fix clothes, garments, electronics, electrical devices, and furniture, contributing to social infrastructure. The right-to-repair movement (Repair.eu, n.d.) and the proliferation of repair-focused content on social media further underscore the communal aspect of repair.

Repair cafes often face limitations in physical set-up, scheduling, the volume of repairs, and the types of products repaired (Moalem & Mosgaard, 2021). Campus-based repair workshops conducted by the PI of this study revealed challenges in attaining a broad range of participants. This limitation inspired the concept of a mobile repair station, with the intention to improve the accessibility of repair on campus. Related work, such as The Mobile Repair Café designed by Simon Frémineur, has addressed some of these limitations with a collaborative mobile workshop built into a converted trailer. The cafe is intended to serve places without repair resources, provide a co-repair experience, and raise awareness about repairs; highlighting the significance of the mobile repair area (The Repair Café Mobile,

2025). This case study builds upon this concept by exploring the repair potential on university campuses through the design, fabrication, and implementation of a mobile repair station.

Methodology for *Designing a Repair Station*

Groundwork for The Mobile Fixer Studio

Scholars have examined various layers of repair activities in product life cycles, sustainable consumption, and the circular economy (Parajuly, et al., 2024; Hernandez et al., 2020). As someone interested in crafts and making, the first author of this paper aimed to explore how her expertise contributes to the repair practice. The repair workshops the PI organizes distinguish themselves from repair cafes by necessitating participants to actively repair their possessions whereas in the repair cafes volunteer experts will fix the broken stuff (Repair Café, 2024). This research started with organizing the repair workshops — which would act as "field site, research instrument, and research account" (Rosner, et.al., 2016, p. 1131) — to inspire people to repair their garments. There have been fifteen repair workshops for participants aged 18 and above. The objectives of these workshops were to:

1. Document different repair techniques.
2. Understand how clothes and garment repair services can be designed.
3. Design a system that facilitates access to repair services.
4. Initiate a debate about the right to repair.
5. Foster responsible decision-making among designers and consumers.
6. Document the repaired items and exhibit them to a broader audience.

According to Earth Day, 87% (equivalent to 40 million tons) of fashion items are thrown into "landfills or incinerators" every year (earthday.org, 2022). So in 2023, the PI of this research started to organize repair workshops which is not the main topic of this paper. These free-to-attend workshops comprised two parts: an initial presentation using a slide deck to provide an overview of repair, highlight its importance, discuss different techniques with a designer mindset, and showcase examples of creative and visible repairs. This presentation aimed to change participants' perspectives on repair. The second part involved group discussions, during which attendees shared their repairable items and identified the repairs they could actively perform during the workshop. All participants were provided with mending tools such as needles, scissors, embroidery floss, felt, glues (e.g., Sugru), pre-made patches, and access to a Cricut machine. Discussions among the workshop groups provided insights into participants' motivations for participating and their intentions to continue repairing. The workshops introduced various repair approaches, including visible and invisible mending methods. Most of the time, the participants got their inspiration from the initial presentation and at times they came up to the PI if they had technical questions. These sessions lasted for two hours each and most of the repairs were successfully finished during the time except for a backpack and a porcelain saucer. Eventually, these workshops inspired the idea of a mobile repair station which would ease the access campus-wide instead of staying put at the workshop venue.

The Mobile Fixer Studio had many challenges to solve in the repair landscape. First, it had to address and mend the limitations that repair initiatives faced in general; then serve a unique location, population need, and project. Initial research into the repair movement brought forth a few crucial limitations: location, schedule, and types of repairs. After conducting interviews with the target population, a few participants shared a feeling of guilt behind throwing away objects that are broken. They often remedy the guilt by quickly disposing of the product to get it off of the conscious mind or store it away, sometimes for years, in hopes of a better future. There appears to be a link between perceived value, cost of the item, and motivation to repair it. There are a few types of products that are overwhelming– those that don't look like they should be taken apart, things with lots of components and wiring, and plug-in small appliances. One hindrance towards repair is a lack of confidence stemming from a lack of knowledge and/or fear of failing or making things worse. These insights became the foundation for the design of the repair station.

The Mobile Fixer Studio

As an extension of the project, the PI and a senior-year industrial design student started

working on a mobile repair station design to travel across campus. This station was inspired by the repair kits of IFixit (2023), and the clothes mending kit Mend.It (Kucher, 2020), and Re-action Collective's bicycle sewing machine (Fernie-Jones, 2023) projects. We also had several meetings with the campus's Zero Waste Initiative to comprehend the waste, recycling, and repurposing situation more in-depth. We had a chance to see the amount of waste gathered closely and attended one of the recyclables sorting events as volunteers.

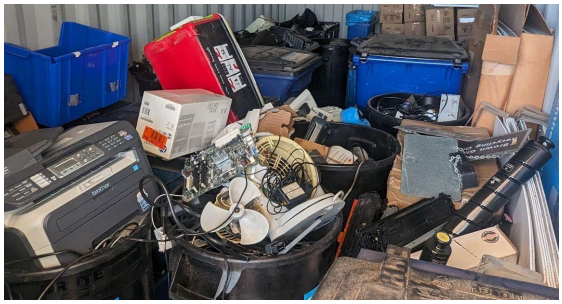

Figure 1. One of the Campus Zero Waste Storages (Photo Credit: Author 1, 2024).

The design of the mobile fixer studio started in the Spring semester of 2024. As mentioned above, the repair workshops provided the necessary tools such as a Cricut Maker 3 machine, various types of needles, hand looms, scrap fabric, felt pieces, and the felt and iron-on vinyl pre-made patches that the PI created. Therefore, the mobile station was required to host these materials and tools. Moreover, the PI requested to have a full toolbox and potentially a sewing machine added to the mobile station. Preliminary findings from the repair workshops were:

1. There is a joy of repairing together,
2. Return on investment for repairs differs for everyone (e.g., emotional aspects, financial gains, and skill development),
3. Negotiations with materials and tools are required before and during the repairs,
4. Fixing is ad hoc designing,
5. Mending can be an outlet for creative expression.

These findings, and the way the workshops were conducted, informed the design of the Mobile Fixer Studio. The design had to act as a gathering space, storing the required equipment and materials and turning into a workstation when needed. After the ideation phase of the mobile station (Figure 2), the 2nd author produced the initial ¼" scaled model (Figure 3).

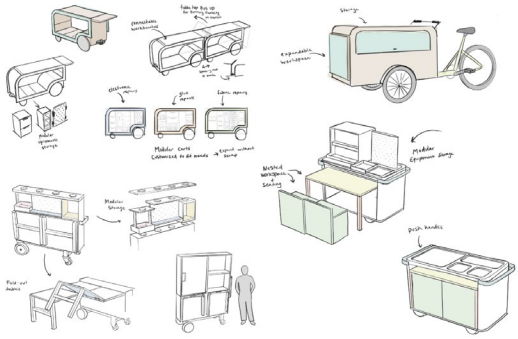

Figure 2. Ideation Sketches (Image Credit: Author 2, 2024).

Figure 3. Initial model (Image Credit: Author 2, 2024).

The design of the repair station took on many iterations. It not only needed to serve a functional purpose but an emotional one as well. The main goals for the prototype were to have a mobile workstation with plenty of comfortable working space, seating, and storage. This was achieved while keeping the principles of modularity, accessibility, and approachability in mind. Initial concepts focused on creating a transformable workstation that is condensed for transport. With the given time frame and resources, we designed the Mobile Fixer Studio to be fabricated using 16GA (1.6mm) Mild Sheet Steel and half-inch (12.7mm) birch plywood. This material choice allowed for the cart to be durable, easily manufacturable, and affordable.

In condensed form, the workstation measures 45 inches long, 24 inches wide, and 43 inches tall 114.3cm x 61cm x 109.2cm). Inspired by street vendor carts, it opens up to a 90-degree counter, allowing the repair instructor and their equipment on one side, and the 'repairee' on

the other side. This not only secures the equipment but makes the experience less overwhelming for the 'repairee'. The unit also features two folding worktables that measure 33 inches by 26 inches (83.9cm x 66cm) when extended and two counter height stools that disassemble flat. In addition, it has a mini mobile workstation that nests inside the main cabinet. The mini workstation gives an additional mobile working surface and is a suitable height for repairers with limited mobility, allowing for more participants.

The station has a set of drawers on one half to store smaller items and materials. These drawers hold three different-sized modular boxes that can be customized to the items to be stored. On the other half of the cart, it has storage for larger equipment such as a sewing machine, and a peg board for easy accessibility of hand tools.

This nomadic unit is far from a traditional working cart. It takes on a more organic shape with prominent curves and circular motifs. While more challenging to fabricate, this softer form made the cart more approachable. The goal was to help alleviate the overwhelmed and intimidated feeling that the population appeared to have towards repair. As for color, we selected it to be eye-catchingly bold; to draw attention without being intimidating. The main cabinet is a vibrant coral with washed red accents, paired with light-toned plywood workspaces and accessories. The color scheme aims to bring a fresh perspective to the traditional red tool cart that is often a symbol of the home workshop.

The fabrication portion of the cart was done with limited time and resources. From conception to fruition, it was fabricated in six weeks primarily using low-tech tooling except a CNC router. The primary fabrication techniques included bending sheet metal with a magnetic hand brake, MIG and TIG welding, rolling sheet metal into curves, metal jigsaw cutting, and CNC routing for the wood. For finishing, the smaller pieces were powder-coated, and the larger cabinet bases were sprayed with urethane paint for durability.

The first review of the prototype was three weeks into fabrication. The intention was for the design to undergo user testing at the Zero Waste Earth Month event to gain feedback for further refinement. With the short timeline only, the base of the cart debuted (Figure 4). The cart had all the critical functional components, wheels, extendable workstations, and the hinge mechanism that allowed it to expand– however, it did not have interior storage, seating, or a mini workspace. While the event did not have as much user interaction as anticipated, the cart was used for a textile repair in its intended manner and was visually evaluated by the population which gave invaluable insights.

Figure 4. Initial prototype and the first Mobile Fixer Studio event on campus (Photo Credit: Author 1, 2024)

After collecting insights from the first debut, it was clear that the original cart was too big in length and width to be efficiently mobile. The original design measured 48 inches long, 30 inches wide, and 43 inches tall (122cm x 76.2cm x 109.2cm); while it had plenty of working and storage space, it was difficult to move with a single person. For the refinement, reducing the size became a priority. This proved challenging in many aspects, the cart not only had to be entirely disassembled and reassembled but cut apart in a way that made a considerable impact on the final size, reduced material waste, and was achievable in three weeks. The second author brought back the design into CAD and experimented, then cut the material down in strategic locations until a method of disassembly was discovered where every piece was to be reused, and the cuts were minimal. This experimentation resulted in a reduction of the overall size by 3 inches in length, and 6 inches in width. After reducing the size and rebuilding the base, every offcut and scrap was reused to make the internal storage and mini cart. The cart became symbolic in the sense that it inherently repaired itself, so remnants of the rebuild on the cart itself were intentionally left visible.

After six weeks of fabricating, modifying, and rebuilding, the prototype (Figure 5) was on exhibition as part of the senior show at Arizona State University during the summer of 2024. While exposure was limited to a design-centered audience, it drew positive feedback from those who interacted with it. The most rewarding experience was seeing a crowd of people autonomously interacting with it, not necessarily in a working repair sense, but in a social sense. It was used as a space for meeting and conversation among the attendees where there was no hesitation to use the table and seating space.

Figure 5. Final 3D Renders of the Mobile Fixer Studio and Final Prototype at the Senior Show (Credit: Authors, 2024).

Future Work

The Mobile Fixer Studio was realized with the help of ASU Herberger Institute's Research Building Investment funds and launching the pop-up workshops was made possible with the help of ASU's main library's (Hayden Library) Learning Resources and Makerspace departments. As soon as the project is published, the design will be open-access and the initial Mobile Fixer Studio will continue to travel across the ASU campus to conduct the pop-up workshops. The first two pop-up workshops of the Mobile Fixer Studio happened in the Spring of 2025 at the Hayden Library on campus where foot traffic is said to exceed 15.000 students daily. These events will create opportunities for campus visitors, faculty, staff, and students to do their repairs when they need it and to get informed about how they can repair their belongings. This research is ongoing, and the PI will continue to gather data to build repair manuals to be used during pop-up workshops and collect information to improve the mobile version of the Fixer Studio (Figure 6).

Figure 6. Timeline of the Repair Research.

Conclusions

Design is not only an act of problem-solving but also an act of changing perspectives, manipulating materials, unraveling complexities, and creating a range of diverse options for both the world and living beings. Repairing and caring for things have a strong relationship with design in terms of the abovementioned acts. Mattern (2018) reflects, "To study maintenance is an act of maintenance. To fill in the gaps in this literature, to draw connections among different disciplines is an act of repair or, simply, of taking care — connecting threads, mending holes, amplifying quiet voices". With this project, we aspire to find more opportunities to make connections both between people and between items and offer a vision for a sustainable, circular future.

Observing individuals who display motivation and inspiration to repair their possessions highlights the potential of design to convince people that there are multiple approaches to fixing things tailored to different skill levels and aspirations. Repair, much like creation, necessitates effective communication and negotiation with materials, demanding substantial time and dedication. Notably, while participants perceived repairing as time-consuming in pre-workshop surveys, their post-workshop responses did not view time as a negative aspect. This indicates that the workshops fostered the development of tacit knowledge, proficiency in tools, expertise in materials, and the cultivation of creative confidence in the realm of repair (Author 1 et al., 2023). With the Mobile Fixer Studio, these events will be more widespread and accessible with the full implementation and integration into the campus system expecting more engagement from campus residents for repairing their broken items or repurposing unwanted products.

Acknowledgments

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