Individual Reflections

ENGR110/210

Perspectives in Assistive Technology

Winter 2025

This document consists of thirty-four Individual Reflections from students who worked on assistive technology projects in the course. Teams consisted of three or four students.

The names of the students, their team names, their project names, the names of the project partners (also known as community partners, project suggestors, or users), and the names of service animals have been redacted to protect their identities and maintain their privacy.

Any questions about these Individual Reflections, the projects, or the course can be directed to me.

The course website can be found at http://engr110.stanford.edu

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[redacted]
ENGR 110: Perspectives in Assistive Technology
Monday, March 17th, 2025

Individual Reflection on the [redacted]

This quarter, my team [redacted], and I worked on the [redacted] in collaboration with [redacted]. From the start, we functioned well as a team, and [redacted] always emphasized that we present ourselves as a team, not just a "group" as Dave encouraged. This distinction reinforced our collective effort and commitment to inclusivity in our design. We also had the opportunity to engage with [redacted] and Dave, two community members whose insights enriched our understanding of the project's impact. Working with them and seeing our design come to life made me even more grateful for choosing this project.

Our design process was extensive, moving from initial research and brainstorming to prototyping and testing. Unlike teams designing for a single user, we had to consider a broad user base, children and individuals with disabilities, specifically those on the autism spectrum. This introduced complexities in obtaining representative feedback, prioritizing features, and refining our direction. One major challenge was determining whether the feedback we received truly accounted for all our intended users. Since many disabilities are not immediately visible, and ethical concerns prevented direct questioning, we had to navigate uncertainty in making informed design choices. The feedback we received often left us questioning whether we were accounting for all potential users. Despite these challenges, feedback from the founder of the foundation provided comfort, as she reassured us, saying something along the lines, "What you are creating can be enjoyed by typical kids, but it will also bring joy to people with autism, as if it were intentionally designed with them in mind. However, the iterative nature of our work, combined with feedback from users, professionals, and peers, helped shape our final design in meaningful ways. However, the iterative nature of our work, combined with feedback from users, professionals, and peers helped shape our final design in meaningful ways.

Engaging with community members like [redacted], kids, and their parents at the Palo Alto playground, and Dave played a crucial role in shaping our design. Unlike teams with a single user, we had to integrate insights from multiple people, which made defining a clear design direction more complex. Some participants had conflicting needs, requiring us to balance inclusivity with practical constraints. Therefore, one of the biggest challenges was obtaining feedback that truly reflected our user base. Because disabilities are not always visible, we couldn't always be sure that the feedback we received accounted for all potential users. Ethical concerns further complicated this, as we couldn't directly ask participants about their disabilities. Despite this, we remained committed to designing for accessibility and sought indirect ways to validate our decisions.

Personally, I enjoyed designing the T-slot track and the shape of the track itself. I spent a lot of time thinking about how to create points where kids would clash with the handles they push around the track. The intention was to design moments where they would engage in problem-solving, when two kids' paths crossed, they would need to figure out how to resolve the situation together. This interaction would encourage them to talk, collaborate, and work through the challenge of getting out of the crash. We were particularly focused on ensuring these design elements enhanced the sensory experience, knowing that children with different sensory needs would benefit from such interactions. Incorporating sensory experiences into our models helped make the track more engaging and accessible for a broader range of users.

Interacting with professionals like [redacted], Dave, and guest lecturers deepened our understanding of user-centered design. A particularly impactful lecture reinforced the importance of iterative feedback and highlighted

that real-world design is rarely a linear process. Sha Yao's work on Eatwell exemplified this approach. Rather than assuming user needs, she refined her tableware set through multiple iterations, ensuring it was perfectly tailored to people with cognitive impairments. She intentionally integrated color psychology to enhance the eating experience, demonstrating how thoughtful design can directly improve users' lives. Her emphasis on refining the design based on user feedback underscored the value of human-centered design and reinforced our commitment to iteration.

Furthermore, one of the most challenging aspects of this project was resisting the urge to compare our team to others. Teams designing for a single user often had a clearer understanding of their needs, while our process felt more fragmented. At times, it seemed like we were falling behind, but I later realized that maybe our approach required a more holistic perspective. Designing for a community rather than an individual meant considering a wider range of perspectives, which, while complex, made our final design more adaptable and inclusive. If I were to go through this process again, I would structure our community engagement more intentionally. Because our feedback came from multiple sources, it sometimes felt scattered.

Developing a clearer system for synthesizing insights and identifying patterns earlier in the process would have streamlined decision-making. Additionally, spending more time refining initial concepts before prototyping could have provided a stronger design foundation. Finally, our project would not have been possible without the valuable support of the teaching staff, especially during moments of uncertainty. Dave's guidance helped refine our approach and reassured us when we felt stuck. Additionally, his feedback, particularly when he mentioned that we might have been a little behind, added a sense of accountability that we were lacking at the beginning. I recognize that scheduling more structured check-ins, particularly for our project with complex user needs, could have provided additional confidence in our decision-making.

Takeaways:

For future students, my biggest advice would be to embrace the iterative nature of design and trust that uncertainty is part of the process. It's easy to feel like other teams have everything figured out, but in reality, every project comes with unique challenges. Comparing your process to others can be discouraging, but it's important to recognize that different teams operate under different constraints.

As a final note, this project was a challenging yet rewarding experience. Designing for a community rather than an individual required me to think critically about inclusivity and adaptability. The nonlinear nature of the process, while frustrating at times, ultimately strengthened my ability to design with intentionality. Moving forward, I will carry these insights with me, particularly in projects involving broader communities, and continue to refine my approach to user-centered design.

ENGR110 Individual Reflection
[redacted]

Through this course, I and my teammates collaborated with the [redacted] to design new attractions in the playground involving sensory experiences specially tailored for children with autism. Our final prototype included the Maze Railing system with Spinner handle, incorporating several tactile elements. While my independent research focuses on tactile interaction and physical design for Blind and Low Vision individuals and I have experience with exploring shapes and textures, this project with [redacted] allowed me to focus more intensely on creating consistently engaging experiences that fostered collaboration and excitement among diverse users.

The biggest challenge during our design process was conducting effective user research and testing. Unlike my previous work targeting specific user groups, in this project we needed to attract all visitors of the [redacted], while addressing the unique sensory experience needs of children with autism at the same time. Defining a clear scope for our design was particularly challenging given the broad spectrum of sensory preferences among users. In addition, although general research provided insights into what kind of tactile interactions were appealing to those targeted users, integrating these insights into tangible prototypes involved considerable iterative experimentation. Thus, our approach was to define the prototype design through these prior studies and keep testing with users on-site.

During our initial playground visit, I observed that local children displayed a strong preference for activities involving intellectual engagement: such as figuring out how the system works, exploring how they can explore the play in other ways, etc. Based on these observations, I proposed building an interactive Maze Railing system that featured a handle incorporating sensory elements such as shapes, rotation, and sound. To test and validate our design concepts, we relied heavily on direct observation rather than formal interviews. By carefully observing children's play behaviors and interactions with our early-stage prototypes over time, we gradually gained valuable insights into their needs. This user testing phase was particularly rewarding, as many kids ran to play with our prototypes, eagerly explored the sensory elements and collaborated together with each other. While designing the overall system that works well and ensuring the safety requirements were challenging, I am glad that we reached our primary goal of sensory experience and those criteria at the same time.

Interactions with guest lecturers significantly reshaped my perspective throughout the course. Each speaker conveyed genuine passion and dedication to addressing their specific challenges. While I used to think like I was standing on users' side enough, when I saw Ralf Hotchkiss talking about his experience with tears in his eyes, it made me rethink how I can view the world from users' perspective enough and how I can work with users toward a better world. That changed my perspective on how to work together with users.

If I were to go through this process again, I would prioritize exploring a broader range of prototypes at an earlier stage of the prototyping process. Our initial strategy involved careful user research and conceptual scoping, leading us to a highly optimized prototype, which resulted in the great final prototype. However, reflecting now, I understand the value of experimentation and testing. We realized the importance of having a playful heart through the prototyping process to make a fully engaging experience in the really later part of the creation process, so I wonder what would have been if we had explored more freely in the first process. Also, if we had more time, I also think it would have been beneficial to involve stakeholders or professionals from developmental psychology or related fields in our testing phases to deepen our understanding of children's cognitive and developmental needs, which I believe would increase the effectiveness and impact of our design.

Throughout the ten weeks of this course, it provided realistic and hands-on experiences in designing assistive technology. The project my team and I created a solution for was a laptop storage device for [redacted], a wheelchair user. This project not only consisted of designing a product but also about understanding the real-world challenges faced by people with mobility impairments that significantly limit their day-to-day lives. Prior to working on this project and attending the lectures with amazing guest speakers, I had general awareness of assistive technology but lacked direct experience designing for users with disabilities. Through attending class sessions, I also learned and was reinforced that design choices have political and social implications - technology can empower or exclude depending on how it's engineered.

Dave's first lecture gave great insights and introduced key concepts of assistive technology, credibility, and the social impact of engineering.

One of the most critical and exciting aspects was applying course concepts to the design process. The first crucial concept was user-centered design. Our team initially assumed side-mounted storage was the best option for [redacted], but after conducting our interviews and gaining more knowledge about her daily activities, our solution had some issues. We realized that it interfered with narrow spaces and risked damaging the laptop. Following this, we made the decision to switch to front-mounted storage, under her legs for better security and accessibility. Under her legs for better security and accessibility. In the lecture with Gayle Curtis, who works creating assistive technologies, he reinforced this idea of understanding the problem and emphasized designing solutions based on the real user's needs, not our assumptions.

Then the prototyping and iteration process proved to be an extremely valuable experience. Only starting with some simple cardboard model to test our dimensions and shape, we refined the design with reinforced straps for stability, adjustable Velcro attachments for universality, and an accessory pouch for a mouse and dongle. Through these trials, failures, and feedback, mirroring what lectures emphasize, engineering as an iterative process. I found Gary M. Berke, MS, CP, and FAAOP's lecture on issues of human interface design helpful during this process. This really guided and illuminated how small design choices impact usability and functionality. Now the importance of user feedback went hand in hand with the concept of user feedback. [redacted]'s feedback proved extremely useful in shaping our design more than the technical aspects. We realized that retrieving a laptop is already frustrating for her and is something that we often take for granted. This was a key and pivotal realization in our design process and went together perfectly with the lecture on getting to know the daily lives of Stanford students and faculty with a disability. I learned so much from their unique and illuminating perspectives, which helped me gain a better understanding of the firsthand experiences of people with disabilities and the importance of inclusive design.

Lastly, a key learning experience and concept of the class was the importance of empathy and the social responsibility of engineers. Just being a listening ear and visualizing how simple day-to-day activities (such as walking the dog or grocery shopping) are more complex for wheelchair users, changed my perspective. Research and getting a background of current solutions to [redacted]'s problem helped me realize that many assistive technologies are expensive, limited, and poorly integrated. This makes accessibility an ethical issue rather than a technical challenge. Our responsibility when it comes to engineering and designing is that accessibility should be a priority, not an afterthought, and technology should be designed to serve everyone equitably, not just those without disabilities. Peter W. Axelson's lecture helped me gain more insight into these responsibilities as his main emphasis was designing beyond the norm to meet the needs of all people. I learned the importance of universal design and ensuring accessibility is embedded in all engineering solutions. I gained a lot of new perspectives on accessibility and empathy in design throughout the course of these lectures. I also learned to think beyond technical aspects, coming to the realization that user experience matters as much as the product itself. The main takeaway from this class will be that inclusive design is not optional - it is essential. I will continue to carry this

mentality into my further projects, as it will prove helpful in ensuring accessibility is built-in from the start, not added later as a secondary concern. As we learned in Ralf Hotchkiss's lecture on wheelchair fabrication in developing countries, he showed how designing for accessibility in real-world conditions can lead to more practical and impactful solutions.

I have worked on assistive technology projects since 8th grade, and I hope to have a career as an engineer in the field of assistive technology. I found Perspectives in Assistive Technology in the course catalog before I applied to Stanford, and it contributed to my choice of Stanford for graduate school. I expected to learn from expert guest lecturers in the field of AT, practice fully understanding a problem, and work with a team to build and test AT prototypes. I consider these expectations to be fully met.

Even though the course was focused on how to fully understand and address a specific individual's need, I still felt prepared for my team's project of designing for a group of people - the visitors to the [redacted]. A highlight of the course were the guest lectures from top experts in the field. I now have a better understanding of the current state of the field of assistive technology, and a better understanding of disability.

My most uncomfortable moment in the course was when we went to the playground to evaluate our prototypes and we had to approach parents, explain our project, and ask for permission to test our prototypes with their children. I do not like going up to people I do not know and asking them for favors, even if I am offering something fun to do, and this was not a skill that I improved (or was taught) in this course. I think I might have had an easier time if I had thought to borrow one of the [redacted] high-vis vests so that I looked more official. Fortunately, my team members were more comfortable with approaching people and the families at the playground were very willing to help us.

Once we had the prototypes set up and I was talking to the kids at the playground about their thoughts on the prototypes (and answering questions about the materials and tools I had used to fabricate the prototypes), I felt very comfortable. I really enjoyed my time at the playground and learned a lot. Our interactions with parents and children at the [redacted] contributed the most to our design. Talking and playing with the children at the park who were testing and enjoying our prototypes was the most rewarding interaction of the course.

We found that higher fidelity prototypes were required for receiving useful feedback when asking children to evaluate our designs. We tested a prototype of the maze and spinner design that was made from cardboard and paper at the same time as we tested a lever/slider/wheel prototype that was fabricated from wood and 3d printed parts. Even though the cardboard and paper prototype worked perfectly well for visually explaining a concept to [redacted], it was not strong or functional enough to interest kids at the park.

My advice to future students is most relevant to teams working with [redacted] or other projects where the project suggestor is not the user. For our project, I was often prioritizing the "coolness factor" design criterion and trying to brainstorm and prototype play element designs that were very different from what currently exists. I ended up prototyping a mechanism-based play element that was almost closer to a science museum exhibit than a traditional playground element. The kids at the park really enjoyed it as their top priority was playing with something new and "cool." The mechanisms also successfully encouraged inclusion and cooperation as the kids worked together to actuate them. Of course, I knew that our other design criteria of safety and durability were essential for a final installed prototype, but I thought that adding safety guards and using more durable materials would be an engineering problem that would take time and money but be clearly solvable. The final prototype built during the course would never be permanently installed so I saw our goal as designing a play element that was primarily cool and inclusive. I had forgotten that [redacted] was the "decider" between our prototyped designs, and as a mom and the CEO of [redacted], she understandably chose the maze and spinner prototype that looked safer and simpler to make durable. I had thought the maze and spinner design would be too similar to other "sensory mazes" that are already available commercially, however I am proud that we succeeded at prototyping a maze that does not have the cheap plastic look and feel that disqualified the commercial products.

Olenka wants to buy several of our sensory mazes to install in [redacted] playgrounds and I am interested in fabricating them this summer, so I consider our project to be a success!

My team communicated about our other time commitments from the beginning so none of this was a surprise, and all of my team members went beyond the course requirements.

However, I have usually spent around 12 hours per week on 3-unit (graduate) courses and I tried to do similar for this course. I enjoyed spending a lot of time in the PRL building prototypes, however, I wish I had not been alone for most of that time. We spent most of our time together as a team on brainstorming, testing our prototypes at the park, and working on our presentations and reports, which I do think was the correct use of our limited time together.

Overall, I think this was an excellent course and I look forward to staying in touch as I work on assistive technology projects in the future.

Individual Reflection
ENGR 110
[redacted] | March 18, 2025

Throughout this quarter, I had the opportunity to engage in a unique design process that combined technical engineering skills with human-centered design. The combination of hearing from professionals, engaging with users, conducting background research, brainstorming solutions, and developing a working prototype provided a very comprehensive learning experience. While each phase of this process played a crucial role in the project's success, some aspects stood out more than others in their impact.

The most impactful part of the process for me was interviewing users and understanding their needs. As a mechanical engineering senior, much of my academic journey has been spent mastering technical skills like CAD design, material selection, and manufacturing processes. However, one area that my coursework hasn't emphasized as strongly is directly interacting with stakeholders/users to better understand their desires for a product. Visiting our project provider at her home and learning firsthand what would make her life easier had a lasting effect on me. That visit allowed me to understand her needs on a deeper level, and her feedback played a crucial role in shaping our design decisions. Getting to know her and hearing her thoughts made me more invested in creating a solution that would genuinely improve her quality of life. This part of the process is something I won't forget and will carry forward in future design projects. In addition to working with users, the guest lecturers were very impactful. Hearing their individual stories helped me understand that the world is filled with people facing a variety of unique challenges. Gaining this perspective early in the course allowed me to approach my project with greater empathy and purpose. Listening to those firsthand experiences motivated me to make our product as effective and reliable as possible. It reinforced the idea that assistive technology isn't just about function, it's about improving lives.

If I were to go through this process again, I would make one key change: I would pace myself better. Due to a busy quarter filled with other commitments, I wasn't able to dedicate as much time to brainstorming and exploring different design ideas as I would have liked. Although I'm proud of the final product, I recognize that spending more time exploring alternative concepts could have opened the door to creative solutions that may have been even better suited to our user's needs. The teaching staff was incredibly supportive throughout the process, and I found their feedback during check-ins helpful. However, if I had spaced out the workload better, I could have been more intentional about seeking additional feedback earlier in the ideation phase. For future students taking this course, my advice would be to make time for creative exploration early in the process. Even if you feel you've already found a solid solution, the best ideas sometimes come from unexpected places.

I initially learned about this course while searching for electives that would fulfill my major requirements. What stood out to me was the opportunity to create a product that could have a meaningful impact on someone's life. I enrolled hoping to apply my engineering skills to a real-world problem, but I didn't expect to be as emotionally impacted as I was. Learning about people's lives, their struggles, and their resilience deeply moved me. The passion and perspective that guest speakers shared gave me a greater appreciation for the importance of assistive technology and the value of thoughtful, inclusive design.

Working with my team was one of the most positive aspects of this experience. Since we were all mechanical engineering seniors, we had a solid foundation in design and manufacturing principles. Our decision to divide the project by subsystem proved to be highly effective. By assigning each team member responsibility for a specific part of the design, we were able to work efficiently while ensuring that each subsystem was carefully developed and refined. This structure helped us merge our ideas successfully and ensured that our final design met all of the project's criteria.

The most challenging part of the experience was deciding on a final solution. During the early ideation phase, our project provider offered limited feedback and few specific suggestions, which I believe was intentional to encourage us to explore creative options. While this uncertainty was frustrating at times, it pushed us to think more critically and test a range of solutions before settling on the final design. Ultimately, this challenge made our solution stronger because it forced us to focus on the most practical and effective option.

One disappointing aspect of the project was that we were unable to test our final prototype with our user before the end of the quarter. Due to scheduling conflicts, we couldn't gather her feedback on the completed device. While this was frustrating, we are committed to delivering the product to her during finals week. Although we didn't get to see her initial reaction, I'm hopeful that our design will meet her needs and improve her nighttime visibility.

The easiest part of the project was the fabrication and assembly of the final prototype. Thanks to our team's experience, the manufacturing process went smoothly. However, I found the one-on-one feedback sessions with our project provider to be the most challenging part. Reviewing prototypes and sketches in an intimate setting felt unfamiliar since mechanical engineering coursework rarely involves direct client interactions. Despite this initial discomfort, I appreciated the opportunity to engage with our user and incorporate her feedback into our design.

Looking back, this course has been one of the most impactful experiences of my undergraduate career. It combined technical problem-solving with empathy-driven design in a way that challenged me to grow both as an engineer and as a person. Working on a project with such tangible social impact has strengthened my understanding of the importance of user-focused design, and I feel confident that this experience will shape how I approach engineering projects in the future.

Man, ENGR 110 has been a wild ride, and working with the [redacted] on the [redacted] for [redacted] service dog, [redacted], totally flipped how I see engineering. I stumbled into this course after hearing about it from a buddy who said it's all about real-world problem-solving, none of that textbook-only nonsense. I signed up expecting some chill prototyping and maybe a few cool lectures, but it turned into way more: a legit mix of hands-on fabrication, deep talks with users like [redacted], and a team vibe that felt like family by the end. Spoiler, it blew past my expectations, and I'm stoked about it.

The project process was a beast, but every step had its own flavor. Brainstorming with the squad was a blast, tossing ideas around, sketching [redacted] concepts, and laughing at the wild ones like a fully automated Rollover that sounded great until [redacted] shut it down. Interviewing [redacted] and [redacted] in Los Gatos was gold; their energy made every chat a highlight, and hearing [redacted] say he wanted control over the poop cleanup shifted our whole design. Background research on scoopers was solid, showing us how lame the prior art was for wheelchair users. Fabricating in Lab64 with laser cutters and 3D printers felt like engineering wizardry and testing the prototype (even if I don't have [redacted]'s exact words yet) was a rush, seeing it work, even if it's still a bit heavy. For me, the most valuable piece was those interactions with [redacted] and [redacted]. They weren't just users; they became homies who pinned me in wrestling and fed us steak at their place. That connection made me care about getting it right, not just slapping something together.

The class was a melting pot of perspectives, guest lecturers dropping knowledge on assistive tech, pros in the PRL showing us fabrication tricks, and community members like the [redacted] grounding it all in real life. [redacted]'s vibe, determined, chill, and straight-up inspiring, stood out. One time at wrestling practice, he pinned me in front of the kids I coach, and I got him back; that moment wasn't political in the article's sense, but reflecting on it through a lens of user empowerment (thanks, structured reflection!) showed me how much he craves agency. That drove our [redacted] manual trigger design. The teaching staff, Lance, Mathilda, and Dave, were clutch, guiding us without spoon-feeding, though I could've used more early feedback on our cardboard mockup to avoid some hiccups.

If I ran this back, I'd push harder on early testing, get [redacted]'s hands on it sooner to nail the weight issue. The process was effective when we listened to him, like ditching the Rollover, but brainstorming got messy with too many cooks. I learned patience and how to pivot fast. Telling my wrestling crew about it, they were hyped, said it's dope I'm building real stuff. Most positive moment? Eating at the [redacted] and feeling like part of their Los Gatos crew. Most surprising? How tough it was to balance stainless steel's strength with keeping it light, engineering's no joke.

This course prepared me for my career by showing how to blend tech skills with human needs, perfect for mechanical engineering gigs I'm eyeing. I still want to know more about lightweight materials; aluminum is on my radar now. Advice for future squads? Dive into user chats early, they're the heart of it. This wasn't just a class; it was a great, chill journey that made me a better engineer and a [redacted] fan for life.

[redacted]
ENGR 110 - Perspectives in Assistive Technology
Winter 2025
INDIVIDUAL REFLECTION

Throughout the Winter quarter, ENGR 110 offered a structured but rigid pathway through the design thinking process, centered around accessibility, assistive technology, and community-engaged innovation. My team worked on the [redacted] project, focused on creating a poop management device for [redacted] - a wheelchair user and service dog owner - whose experience caring for his service animal raised real-world, tangible design challenges. This work was inspired by authentic need, but the process of addressing that need came with its own limitations, particularly from how the class was run and how interactions were managed.

The Design Process: Structure and Stumbles

The initial phases of our design process were standard and relatively productive: background research, needs assessment, and stakeholder interviews helped form a foundation. For [redacted], the challenge was straightforward: managing pet waste independently and hygienically. From this, we started ideating and mapping out possible mechanical solutions that could integrate with a wheelchair or be easily stowed and operated one-handed.

Fabrication and testing were the most valuable parts of this process for me. The opportunity to take a concept through prototyping brought it to life in a way that brainstorming and peer feedback never could. Handling actual materials, measuring constraints, and witnessing what worked (and what failed) in real-time made the engineering feel meaningful. It also helped refine the empathy we had developed during our interviews with the [redacted]'s and others with similar challenges.

[redacted]

The most productive and memorable parts of the class came from direct conversations with [redacted] and others like him. These real-world interactions helped ground our work in authentic experience and avoid solutions that were too theoretical or naïve. [redacted]s honesty and specificity forced our team to think practically: How will this be carried? Can it be cleaned easily? Is it one-handed? These constraints shaped every aspect of the design.

Guest speakers and professionals also brought in insights that shaped our understanding of disability, independence, and assistive technology ecosystems. However, few of these interactions were followed up with substantive engagement. Often, they felt like missed opportunities – quick visits rather than ongoing mentorship.

That said, brainstorming with classmates occasionally opened new pathways. Working with students from different backgrounds brought diverse ideas to the table, although collaboration was sometimes stifled by the classroom structure and non-committed teammates. There was often more support offered than delivered, which made the experience uneven.

[redacted]

[redacted]

[redacted]

Final Thoughts

Despite the frustrations, I value the [redacted] project because of its real-world impact and clarity of purpose. Building something for someone with a specific, expressed need gave our work urgency and relevance. I learned that real design often starts where imagination meets constraint - and that understanding the user is far more important than satisfying a rubric. In the end, what mattered most was not the classroom, but the community.

[redacted]
ENGR 110

Throughout this course, my team and I collaborated to design a battery-operated water bottle opener for [redacted], a member of our community with cerebral palsy. This experience was a test of our technical and problem-solving skills and also an opportunity for me to engage with people with disabilities and assistive technology in a personal way. Working in a group of four, we faced challenges and successes that showed the importance of user-centered design and interdisciplinary teamwork.

One of the most rewarding aspects of this project was working directly with [redacted] and [redacted]. Their energy and insight made the class exciting to look forward to. His specific needs and challenges guided our design process, ensuring that our solution was not just functional but also tailored to his abilities. We conducted interviews and tests to refine our prototype, which allowed us to understand the real-world implications of our design choices. This personalized approach taught me the importance of empathy in engineering and how much more rewarding it is to design alongside the user instead of for them like mechanical engineers typically do.

Unfortunately, although the opener did not gain the results we wanted 100%, it was a great learning experience for the future and it got me interested in a field i hadn't thought of previously.

The structure of the course, particularly the guest lectures were interesting as there was a new topic explored every lecture. Experts in assistive technology from different fields presented insights into different types of assistive devices and the engineering principles behind them. These lectures helped me understand the larger impact of assistive technology on individuals with disabilities. It was fascinating to learn about the range of solutions available and how innovation in this field continuously develops.

Aside from the technical challenges, the class also strengthened my teamwork and communication skills. Collaborating with three other students required delegation of tasks, open communication, and adaptability. We each brought different strengths to the table - some of us focused on mechanical design, while others handled interviews and research. The need for continuous collaboration and compromise was a valuable lesson which I know will be crucial in any future engineering projects.

In this course, I realize how impactful it has been on my approach to design and problem-solving. Assistive Technology is a field that directly improves quality of life for individuals with disabilities. This course reinforced my belief that good engineering is about making a difference. I now feel inspired to explore how technology can be developed to create inclusive solutions that empower people with different kinds of disabilities and allow them to live a more independent lifestyle.

Overall, this experience has shaped my perspective on engineering and reinforced my passion for designing meaningful, user-centered solutions. Working on a project that had a direct impact on someone's daily life made this one of the most fulfilling experiences I have had at Stanford. I am grateful for the opportunity to apply my skills in a way that truly mattered and look forward to continuing to explore how engineering can make a difference in people's lives.

[redacted]
ENGR 110
Winter 2025
Individual Reflection

Reflecting on my experience with my team, the [redacted], and the enhanced visibility project for [redacted] in ENGR 110, I've gained valuable insights into the design process, teamwork, and problem-solving. This project aimed to enhance the visibility of [redacted]'s wheelchair to improve her safety and independence in low-light conditions. Throughout the quarter, we progressed through several stages: problem analysis, brainstorming, prototyping, and final testing. Each phase contributed uniquely to our final solution.

I initially heard about ENGR 110 from peers who highlighted its hands-on approach to assistive technology. Given my interest in the intersection of technology and healthcare, particularly with medical devices and prosthetics, I enrolled to explore how engineering could directly improve people's lives. Furthermore, there's not many opportunities, engineering-wise, to get into the community and impact the people we are surrounded by. I have done community work before, and it would be a shame if I did not get a chance to use what I've learned at Stanford to help others. My expectations were to engage with community members and create something impactful. These expectations were not only met but exceeded - I walked away with a deeper appreciation for user-centered design and the importance of iterative prototyping.

One of the most valuable parts of the process was interacting with [redacted], our user. I appreciate that she welcomed us into her home, and I learned so much from the visits. We were given opportunities to ride her WHILL wheelchairs, something that I was thinking about ever since the first day of class. She allowed her a glimpse into her life, how she gets around, and more and it was interesting to see. Her feedback guided our design choices more than any background research could have. For example, she always emphasized the need of ideating and to be solution agnostic. This was reiterated from a previous class I took, Needs Findings in Healthcare. When presenting to her ideas of our concepts, from suction cup lights to fender-mounted lighting systems, she expressed her likes and discontents with each idea. This eventually led us to developing the light box. With the constant communication we were in with [redacted], in addition to insights from guest lecturers and community members, made the project feel more grounded in real-world needs.

Each phase held a different value. Brainstorming was energizing - we explored everything from clip-on lights to underglow kits. Background research helped us understand existing solutions and why they fell short. Prototyping was the most educational. Our first prototype's weak LED lights taught us the importance of power sources, pushing us to upgrade to a 12V rechargeable battery. We also learned that securement methods matter just as much as the core technology - Velcro and grip tape ensured stability without permanent modifications, a requirement that Abby emphasized. Challenges were inevitable. One major hurdle was finding a balance between brightness and portability. Early LED strips were too dim, while brighter setups drained power quickly. Our switch to a remote-controlled, battery-powered LED strip provided the right balance. Another challenge was ensuring the design was non-intrusive yet effective. [redacted]'s comfort and ease of use remained priorities, leading us to redesign with rounded corners and a compact form factor.

If I were to redo this project, I would push for earlier prototyping. Our foam core models came late in the process and having them earlier could have saved time in adjusting dimensions and fit. I would also recommend that the team sketch our ideas instead of creating them using CAD. This took time, and this time could have been better spent conversing with [redacted] about the sketches. Then, we could have just made one CAD model instead of multiple. I also think more structured guidance on integrating third-party electronics would help – we spent time troubleshooting components that didn't communicate well with each other. Eventually, we were able to figure it

out, but as the team was all mechanical engineering majors, we did not have much experience with electronics. However, the teaching staff was incredibly supportive, especially during design reviews. Their feedback on practicality and user comfort
proved invaluable.

My advice to future students is to prioritize user feedback early and often. It's tempting to focus on the coolest design, but the best solution is one that fits the user's actual needs. Prototyping doesn't have to be fancy - foam core, tape, and even paper are enough to gather useful insights. Secondly, meet with your users and/or community members as soon as possible. Once the quarter starts to pick up, it'll be harder to coordinate time with your user to meet and discuss future plans. Lastly, embrace failures. Don't be afraid to try things even if you are unsure if it will work. While the budget can seem limiting, the process of prototyping is all about learning and what you take away is more valuable. For example, our first dim LED strip felt like a setback, but it pushed us to find a better power solution.

One suggestion I would make is to provide transportation grants for each team. Transportation can often be a significant hurdle for college students, especially when projects require off-campus engagement. The cost and logistics of getting to and from community sites can deter students from fully immersing themselves in valuable hands-on experiences. Since many projects involve collaborating with local organizations and community members, ensuring reliable and affordable transportation would remove a major barrier. These grants would not only ease the financial burden but also promote more consistent, meaningful engagement with the communities we aim to support. This is merely a suggestion, but I am confident that future students would appreciate this.

In the end, this project taught me that successful design isn't just about technical solutions - it's about listening, iterating, and creating with empathy. [redacted] didn't just build a product for [redacted]; we built it with her, and that collaboration made all the difference.

[redacted]
Professor Jaffe
Engr 110
17 March 2025
Individual Reflection

Taking this class and working with [redacted] and the [redacted] was an incredibly rewarding experience that allowed me to grow both personally and professionally. For me, this project was more than just taking a class to obtain a grade, but was an opportunity for meaningful collaboration and work to improve the quality of life of others, as well as an opportunity to gain real-life, hands-on experience with an engineering project. Reflecting on the process, the lessons learned, and the skills developed, I can confidently say that this experience was one of the most valuable of my academic journey.

The lectures and guest speakers throughout the course were incredibly insightful and deepened my understanding of the diverse challenges faced by individuals with disabilities. Each speaker brought a unique perspective, sharing their personal experiences, professional expertise, and innovative approaches to creating inclusive solutions. It was also very insightful to hear about all of the different aspects and areas that can be explored, including technical solutions, more policy-based solutions, and even bridging from school projects to successful companies. These sessions were not only educational but also inspiring, as they emphasized and showcased the complex challenges faced by individuals with disabilities. Hearing these stories and insights firsthand reinforced the importance of inclusivity in all aspects of design and left me with a greater appreciation for the work being done to create a more equitable world.

I consider myself very fortunate to have been working with [redacted] and the [redacted]. Before this class, I had never worked with an organization outside of school before, so with this experience came many lessons learned. It was extremely helpful meeting with [redacted] at the [redacted], and learning about the organization's past, purpose, and where my team was supposed to fit in. Being at the site and being able to hear her thoughts and suggestions was very helpful and influential in shaping the direction of our project.

The project process was a dynamic and collaborative effort that required careful planning, creativity, and adaptability. From the initial brainstorming sessions to the final presentation and report, every step of the process taught me something new. One of the most significant aspects of this project was learning how to navigate working with an external organization. Understanding their goals, values, and expectations was crucial to ensuring that our project aligned with their mission. This experience taught me the importance of effective communication and active listening, as we had to balance the organization's needs with our own ideas and capabilities.

One of the most valuable aspects of this project was the opportunity to work on something with real-world implications. Knowing that our efforts could contribute to a space that brings joy and inclusivity to so many people was incredibly motivating. It challenged me to focus on empathy and human-centered design was a key takeaway for me, and it's something I will carry forward in future projects.

The collaborative nature of the project also taught me a great deal about teamwork and leadership. Working with a diverse group of individuals, each with their own strengths and perspectives, was both challenging and enriching. We had to navigate differing opinions, delegate tasks effectively, and ensure that everyone felt heard and valued. This experience highlighted the importance of flexibility and compromise in a team setting. I learned

that successful collaboration isn't about everyone agreeing all the time but about finding common ground and working toward a shared goal.

Another significant aspect of the project was the development of practical skills, particularly in presentations and report writing. Presenting our ideas to the organization and our classmates was a nerve-wracking but ultimately rewarding experience. It pushed me to refine my public speaking skills, organize my thoughts clearly and convey our project's value in a compelling way. Similarly, writing the report taught me how to articulate our process, findings, and recommendations in a structured and professional manner. These skills are invaluable and will undoubtedly serve me well in my future career.

Individually, I am incredibly proud of what I was able to achieve through this project. It challenged me to step out of my comfort zone, think critically, and contribute meaningfully to a team effort. The experience reinforced my passion for working on projects that have a positive social impact and showed me the importance of aligning my work with my values. It also gave me a greater appreciation for the power of collaboration and the importance of effective communication in achieving shared goals.

If I were to change anything, I would have looked to try and have better communication between my team and the [redacted]. We were communicating with three separate contacts with the [redacted], and in some meetings, it was clear that people had looked at certain messages we had sent and had missed others, leading to inefficient communication and overall slower progress. Being sharper and quicker with our communication could have resulted in more time for us to work on the project and make further progress.

In conclusion, the [redacted] Project was a transformative experience that taught me invaluable lessons about teamwork, communication, and the impact of human-centered design. It was a reminder that the work we do as students and professionals has the potential to create meaningful change in the world. I am grateful for the opportunity to have been part of such a special project and look forward to applying the skills and insights I gained to future endeavors. This experience has left me inspired and motivated to continue pursuing work that makes a difference, and I will always cherish the memories and lessons from this project.

[redacted]
Professor David L. Jaffe
ENGR 110: Perspectives in Assistive Technology
16 March 2025
Engineering 110: Perspectives in Assistive Technology - Final Reflection

This was my first engineering class that I have taken at Stanford and I thoroughly enjoyed it. Being a Science, Technology, and Society major, I was a bit nervous taking an engineering class and felt out of place in the beginning. However, from the very first lecture I realized that Dave and the course assistants made everyone feel welcomed. They assured me that I could learn a great deal from the class even if I did not have a huge background in design. I decided to take this class because it serves as a technical requirement for my major. My concentration is in innovation and organization, so when I read the course description and browsed the website, I realized immediately that this would benefit my education and areas of interest. As someone interested in business, I knew that working with individuals to bring innovative designs to life and solve real-world problems would be a huge benefit to me in the future. The skills that I could learn from the class made it a no-brainer decision to take it. Now, after taking it, the course has led me to plan other design and engineering classes to my curriculum plan since I enjoyed it so much. It also opened my eyes to the importance of assistive technology and how more design that accounts for disabilities needs to be done. My team worked with the [redacted] and this really changed my perspective about how I see playgrounds. Seeing how the park was built for everyone was really neat and being able to help build a prototype for the park that could enhance the experience of park-goers gave meaning to my work. Overall, I think that was the best part of the class as the projects were all meaningful and fostered special relationships.

Interviewing [redacted] and being able to visit the park provided so much insight into a design we believed could benefit users at the park. Getting to test our products with the children there allowed us to get positive feedback instead of making assumptions. Background research and looking at prior art was also helpful as we could understand what existing products did well and where there were shortcomings. The research allowed us to create a product that was not redundant and had a specific goal in mind. The brainstorming was also really helpful as we were able to come up with some really creative ideas and even start to put ideas together or build off of them. Lastly, the fabrication and testing were critical to taking our ideas actually turning them into tangible prototypes. By testing it out, we learned so much that we would have never thought of or overlooked, and it led to much needed improvement in the design.

The different interactions in the class helped our team so much with the results of our design. The most rewarding interaction was working with [redacted], the founder of the [redacted], as she is an expert in accessible playground technology. She was really nice to work with and was constantly giving us input and feedback on our designs and prototypes.

However, she also left us the freedom to be creative and come up with a prototype of our choice. Dave was also super helpful as his experience and wisdom helped us to look at the project in new ways. He kept us on track and reminded us of important benchmarks to hit. Lastly, I learned a ton from my teammates. Getting to work with a graduate mechanical engineering student and a senior studying design who both had major experience in designing and fabricating prototypes taught me so much. Seeing how they would sketch designs, implement 3D computer models, and then build them using the laser cutter or a 3D printer was something that was completely new for me.

If I were to go through this process again, I wish I would have asked more questions during the lectures and picked the brains of guest speakers. I get nervous about public speaking but looking back I wish I would have

asked more questions. I also would have liked to contribute more to the brainstorming process. While I did help come up with different ideas, I also let some of my other teammates take the lead in this realm because they had more experience as engineers and designers. Looking back, I wish I was not as scared of rejection, and willing to throw out more ideas than I did. There was a ton of support from the teaching team that was very helpful. One of the things that made it really helpful was how organized and structured the class was.

There were so many resources and helpful sections on the class website, and they were super accessible. The classes were also very organized and always moved in the same direction, so it was easy to know what to expect when coming to class. My advice to future students is to take risks in the brainstorming and design process. Do not be scared of failure or wait for the perfect idea. Often many of my team's first ideas gave us discussions and further ideas that would ultimately lead to our final design. Also, make sure to stay on top of your project and communicate with teammates. The quarter goes by so fast and before you know it the midterm and final presentations are upon you. Make sure to delegate adequate time to meet with teammates and your project partner and be open and flexible to new ideas and inputs. Take advantage of the different information and feedback you receive from your partners, the teaching team, and the guest lectures. They have been doing this for a while and have so much wisdom in this field.

One of the main challenges we encountered with our team was coordinating times when we could work on the project together. All of us had busy schedules with classes and extracurricular activities, so making sure we were constantly communicating and planning the next steps in the project was crucial for us. Another challenge for us was being able to focus on one area of the [redacted] to incorporate an assistive technology design. Other projects tended to have a singular problem to address. However, our project was wide open for ideas. Thankfully, with the help of [redacted] and Dave, as well as input from users of the park, we were able to realize that sensory play was something that needed to be addressed in the park. Our project had several ethical issues as we were working with children using the park. For example, after building our first prototypes, we went to the park to get user feedback and test the products on park-goers. We realized that we could not just go up to children at the park and begin communicating with them. We made sure to approach parents and give them a run-down and who we were and what we were doing in the park. We then asked for their permission to have their children play with our prototypes. Thankfully, many of the parents were really interested when they heard about the project and more than willing to let their children work with us. While the children were testing our prototypes out, we also thought about potentially taking pictures for our final report and presentation. However, we realized again that this was an ethical dilemma. We realized that we would have to ask for parent permission again, but with the busyness of the park we decided that it would just be best to not put this pressure on the parents and overburden them on such a nice day.

One of the major things I learned in this class was how to communicate and work with an individual or client needing assistive technology. That was one thing that I really liked about all of the lecture speakers; they had a major emphasis on creating positive relationships with their clients and teams that centered around trust and honesty. Dave also did a great job of explaining during the classes about the importance of the language we use when addressing our project partners and ways to work with them to bring the best designs to life. Another thing I learned from my teammates and from Dave and the lecturers was how to brainstorm as a designer and then how to create efficient, cheap prototypes. I really like how the teaching team encouraged us to build cheap prototypes out of paper, cardboard, and any material that was easily accessible. I was expecting many of the prototypes to be extremely complicated and made out of fancy materials. Yet, I was pleasantly surprised when I realized that designing prototypes should be kept simple and be done efficiently.

One of the things I think our team did well was delegating roles and tasks effectively. We all shared the workload and made sure to play to our personal strengths. We also did well to take [redacted] and Dave's feedback and apply

it thoughtfully. Overall, some of the most positive incidents were when we went to the park to get user testing with our prototypes, when we scored first on the midterm presentation, and when we were able to show our prototypes to the class.

Seeing how the children loved the design and were all playing with the prototype gave us so much joy. Seeing all of our hard work and time that we put into nailing the presentation get rewarded was awesome. Finally, getting to see all of the other prototypes and talk to the makers while also showing off ours and getting compliments was super fulfilling. I'm super grateful that I was able to get in a great group, with smart yet thoughtful and kind students. They were always there to help me out when I was confused and taught me so much.

Relating my experiences in the class to my family and friends was really fun. All of them were so curious about the different topics and loved how purposeful and meaningful it all was. It was also neat to see how their questions were able to foster a discussion on the importance of accessible design and technology and the need for more of it. I felt extremely proud when I was able to explain the goal of my team's project and they're very few classes that I've taken where that's the case. Overall, this has been one of my favorite classes that I've had the pleasure of taking at Stanford, and many of the skills I've learned will stay with me afterwards. I have already highly recommended it to my friends!

[redacted]
ENGR 110: Perspectives in Assistive Technology
Individual Reflection

This quarter of taking ENGR 110: Perspectives in Assistive Technology has been an absolutely amazing experience! There are so many different things that I can talk about in regard to how Great this class was but I believe of all the amazing aspects, I would have to say that the relationships that were created throughout these past 10 weeks were the best part.

It started as I looked at the STS curriculum in planning my classes for my winter quarter. I saw this class listed as one that was compatible with my major and curriculum plan and after reading the description and seeing what came with taking this class, I went ahead and filled out the form and would later meet with Dave before the fall quarter ended. After talking to him, sharing about myself and learning about him and how he runs his class and what it was about, I thought that it was a Great idea to take the class and that it would be an amazing experience. The part that hooked me the most that really pushed me to take this class was that I would be given the opportunity to be able to help someone who has a disability and that I would be given the opportunity to help them overcome a disability that they had.

As I began the class and was put into a TEAM where we would work to assist someone, my TEAM was assigned with the project of assisting a man named [redacted], who had cerebral palsy, in helping him to be able to pick up after his dog [redacted] when she did her business. He was in a wheelchair and had very limited mobility and so this would be a challenge for us to be able to complete it for him but nevertheless we tackled it. [redacted] has a brother named [redacted] who is an absolute stand-up guy and he was present throughout the whole process as he is a main caretaker for [redacted] and WOW! They are a killer duo that made the project process so amazing and extremely enjoyable! We worked with them on design and logistics and how they wanted the pooper scooper that we were constructing for [redacted] to be and they were very easy and fun to work with. The best part of this relationship between us and [redacted] was that it extended outside of the classroom. The [redacted]'s were very hospitable to us and had us over to their house in Los Gatos for an amazing homemade dinner as well as attended a couple of my wrestling dual meets and were avid fans of something that I do and is near and dear to my heart.

With all the amazing things this class brought, even though it was a tough challenge, my group and I were able to work to create something very COOL and hopefully suitable for [redacted] and his wheelchair that would allow him to be able to pick up after [redacted] independently on his own! I feel like the process of completing this went very well and I would say pretty smooth for the most part for our group! If I were to go through this again I feel like I wouldn't change much besides maybe just putting a little more pep in my step with getting the project going just to guarantee that we had enough time and weren't rushed in case something needed to be altered or changed and that would be a bit of advice that I would give to someone that would be taking this class in the future. But beyond that, I would say that my advice would be to just enjoy the ride and who you're riding with. Because like I said at the beginning, that was what made this experience so great for me. I leave this quarter very happy and filled with genuine joy in the relationship that I now have with the [redacted]'s (that will continue in the future) and also with those whom I worked with! I am very Blessed to have taken this class and I hope that those who take this class in the future will be able to have a similar experience as I had!

Message to TA's/Dave: I've said this quite a lot in the weekly reports for the [redacted] but I really wanted to say thank you for everything, genuinely! This class experience this quarter is like no other that I've ever had, and it definitely wasn't possible without you guys. Thank you guys for the opportunities of being able to help someone in need and also for the opportunity to learn about such Great people who have made amazing impacts

and for the relationships that I was able build from this class with the amazing people around me! You guys are truly awesome!

God Bless and Thank you!

[redacted]
ENGR 110: Perspectives in Assistive Technology
3.16.2025
Individual Reflection

Through the quarter, I learned about assistive technology and its uses from a variety of different sources from experts in the field giving lectures in class to interviewing users in the field. While all of these methods influenced our design and fabrication process, I think that the interviews with [redacted] were the most impactful. Those conversations were the most insightful that we had into the life and needs of people who use assistive technologies. They also were the most impactful towards our final design, as they were directly about the preferences and limits of the intended user.

Our project went well overall, I think. I am glad to say that I think it was properly scoped, as it felt like the goal of the project was achievable, yet still challenging to find the right solution. I do, however, now recognize the value of having extensive PRL experience on a team. As the only mechanical engineering major in the group, I was the only one with much experience going through the design process and working in the PRL. I definitely think that I had a better grasp on what was feasible and how to work around the fabrication constraints the PRL presented better than my groupmates, who took some time to catch on. Furthermore, only having one person that had an idea of fabrication methods and how long fabrication takes was definitely a struggle when coming up with our timeline. While the other members of the group certainly helped, it took some time to get them up to speed with what was needed for the project.

I think that the weakest point of the process was the guidance in the beginning of the project process. I found that I only figured out what sorts of things I needed to consider when designing and fabricating for individuals with disabilities later in the quarter once I had spoken with [redacted] a handful of times. While I don't expect a lecture on all the variables to consider, I think that taking one class to break down what sorts of variables should be considered in the scope of this project would help a lot in the early stages. I think that our project felt slow to start and rushed at the end because of a lack of understanding of the project to start.

When I reflect on our team meetings, I think that we definitely could have been much more efficient and productive if we had planned out more before meeting. Much of the planning was done during the meetings, which left a lot of clarification up to our group chat, which was nowhere near as productive as meeting in person. Getting four people's schedules to line up is tough, especially when three are athletes with practice and two of the athletes are in season, so laying the groundwork for our meetings beforehand would have made the process much smoother.

I think our biggest challenge as a group was figuring out how to design a product for a specific person. My group members had little to no PRL/engineering project experience, and I had only done projects in classes for myself/my team, so none of us had previous experience working with a specific user. I think those struggles showed in the beginning of the quarter when we jumped the gun on designing and creating prototypes without consulting our end user, [redacted] We were too focused on solving the problem and finding a solution that we would be ok with that we forgot that we are not actually the end users. While our initial designs would have worked in theory, they did not comply with the requirements that [redacted] came up with in response to our initial designs. This taught us that the design process, especially when designing for an individual or small group of individuals with specific needs, should be done in close collaboration and with constant channels of communication. That was a lesson that we learned early on in the process and made sure to remedy moving forward. It did create some tension and frustration, however, as there were times that we really wanted a certain idea or design to work,

but [redacted] didn't like it. Finding a way to empathize and put our own design goals aside for the purpose of a greater product for our end user was difficult at times, but I think that we always prevailed in that regard.

With regards to the class sessions, I think that some of the lectures felt repetitive and went on for a little too long. While I see the value of what the guest lecturers are saying, an hour and a half of lecture on a subject that is not directly related to the main project of the class is difficult to sit through, especially towards the end of the quarter when work was piling up.

While hearing from engineers who design assistive technologies was interesting, it didn't give us as much insight into the needs of users. In addition, I found that the research and development that many of the professionals were doing was far beyond the scope of the projects in this 10 week quarter, and while interesting nonetheless, did not greatly impact our design process. With that being said, I think the most powerful of the guest speakers was when members of the Stanford community came to speak about their experiences with living with a disability at Stanford. I think that the shared lens of "both being students at Stanford" made their presentations so much more impactful, as their experience was so drastically different from mine. It was the one that really made me reflect on my privileged experience and how others might not be so lucky.

One other thing I would note about the course is that it completely changed my perspective on what kinds of engineering opportunities are out there in the world. As a junior in mechanical engineering who hasn't had the ability to do an internship yet, this class exposed me to a small sector of a much wider world of engineering. There were problems that I had no clue existed that entire companies were working to solve, and yet I had not even heard of them until taking this class. It changed my perspective from "engineers build cars and go to space" to "engineers solve problems to truly improve people's lives". And that, to me, is a much higher calling than going to space or building the fastest car (even though that's super cool too). I think this class changed my perspective on how the design process works, which is something that I will take into consideration at all points in my career. In the past I only solved a problem or built a model for myself or maybe a small group of teammates, but then I had to incorporate user feedback into the design. That was a difficult transition for me to make since I thought my idea was the best or most efficient, but it did not satisfy an unspoken requirement for the user. That was a strange shift, and a lesson that I will definitely carry with me as I go forward in my engineering career.

I would tell future students to get ahead on the prototyping process. We spent far too long ideating and trying to figure out our solution when we should have been rapid firing ideas, getting quick feedback, and iterating on those faster. The faster the project starts, the less hectic it is in the end and the better product is produced.

[redacted]
David L. Jaffe
ENGR 110: Perspectives in Assistive Technology
17 March 2025
Individual Reflection

Originally, I heard about this course through my major advisor and was immediately intrigued given how unique the course sounded as well as because I hadn't had the opportunity to take many engineering courses. I ultimately decided to take it because I was drawn to the opportunity to work on a hands-on project that directly impacts people's lives. I also saw it as a way to challenge myself by applying creativity and critical thinking to an area I hadn't explored before. Coming into the course, my expectation was that it would provide a hands-on, collaborative environment where I could apply creative problem-solving to a real-world challenge while learning about the intersection of technology and accessibility. I definitely think that my expectations were met, given that I had the opportunity to work with a great group of people ([redacted] especially) to develop a laptop storage device that securely attaches to a wheelchair, allowing our team member partner to easily retrieve her laptop while staying seated.

I think what my team and I did best was taking the opportunity to meet with [redacted] in person about 3-4 times as well as continually communicate with her via email in order to ensure we were making a positive difference in solving her problem. However, at times, the journey was challenging for me given the fact that I don't have much experience with building products from scratch, and 10 weeks isn't a lot of time to iterate through multiple design prototypes, troubleshoot unexpected issues, and refine the final product to the level of precision I would have liked. Thus, there were a lot of times where I had to push myself outside of my comfort zone, but I think that was one of the most positive aspects of the course for me personally. I experienced a lot of growth in my ability to adapt to unfamiliar challenges, learn new technical skills on the fly, and collaborate effectively with a team in a hands-on, problem-solving environment.

One of the most surprising aspects of the course was just how many iterations our design went through. I must admit, I was a little surprised by the amount of critical feedback [redacted] provided after testing it - pointing out several aspects that needed improvement. When we created the second prototype, we encountered even more critiques that pushed us to rethink and refine our approach yet again before arriving at the third version. While I wasn't expecting to overhaul our design so many times, I'm really glad [redacted] was so engaged in the process, as her feedback ultimately made our final product much stronger and more functional. One aspect that came naturally to me was collaborating and communicating with my teammates and [redacted], but I found the technical side - working with CAD and building the product -more challenging. Ethically, we made sure to prioritize [redacted]'s input over our own assumptions by maintaining open communication and incorporating her feedback at every stage.

Overall, throughout the design process, one of the most impactful steps was observing how other teams prototyped their own design (getting to see this during the midterm presentations was especially helpful). Seeing the creative ways they tackled different challenges gave us inspiration and helped us refine our own approach. The most difficult aspect was managing the time constraints of a 10-week course while iterating through multiple prototypes and still having enough time to finalize the project - including labor-intensive tasks like hand-stitching the straps. Beyond [redacted]'s feedback, I really enjoyed the variety of guest lectures, which broadened my understanding of assistive technology and the diverse challenges people with disabilities face. While their insights didn't directly influence our project - since many speakers worked on far more advanced engineering solutions - it was eye-opening to learn about issues I hadn't previously considered. If I were to go through this process again, I would aim to complete our first two prototypes earlier to allow more time for fine-tuning, especially in areas

like stitching, which would have improved the final product's aesthetics while maintaining functionality. I felt that the instructional support was strong, especially Dave's guidance in keeping us on track with our timeline and offering valuable feedback. For future students, I'd recommend scheduling an initial meeting with their project partner as early as possible, even before brainstorming solutions, to better understand their needs and integrate that knowledge from the start.

[redacted]
ENGR 110
March 21 2025
Reflection

Lecture Series

I found the lecture series very interesting. It was fascinating listening to the experiences of those whose disabilities cause difficulty in normal life. I think it was valuable to see both the development side of accessible technology as well as the user side. I will say however, it would have been nice to alternate between a lecture speaker and a working session every week. Maybe Tuesday could focus on group projects and Thursday could be a speaker. This would allow groups to have more interaction with each other and the teaching team. Especially in groups with busy students, this sets a locked-in time where everyone is available.

Accessibility Group Project

The group project was very different from my other project experiences. Starting with the project pitching, it was very interesting to work with a community member on something that might improve their lives personally rather than a general-use product. However, this did create some issues. Although the projects were pitched in person, the scope of a required solution was often not very clear. This led to a situation where some groups felt the project was over-scoped and would not lead to a robust solution within the given time frame. Another difficulty we faced was having regular meetings with our community member. As a result of not having a car, it was expensive to travel to their residence and although it was necessary to gain perspective on their living situation at least once, if we wanted to test our prototype, it would require us to travel again. Something that might make this easier would be arranging transport or ensuring the community member attends the course once every week or 2. Alternatively, the course could ensure that they (community members) are willing to travel to campus every so often.

Moving on to the logistics of the group work, although choosing teams can be fun, especially with friends in the class, I think there is value in assigning teams based on differing skill sets. There was a large range in the year of the students as well as a large variety when it comes to majors. A quick survey to mix different skill sets in different teams would work to significantly increase the understanding and quality of the projects. Additionally, some of the more technical projects could be paired with students and teams who have more technical skills.

The effects of my personal interactions with users, community members, guest lecturers, professionals in determining or contributing to our groups design where very minimal for the most part. The initial visit and discussion with our community member helped to determine our user requirements as well as some design parameters that we would later follow. Apart from this initial meeting, the time constraints that came with the quarter and part ordering led us to not have the bandwidth to consider any adaptations or serious design changes that other parties might have suggested.

Advice to future Students

The first and most important piece of advice I would give to future students is to make sure you know and understand the full scope of the project. My group was quick to claim a project to ensure no one claimed it before us. We did not take the time to fully understand our project or consider the resources and time required to produce a robust prototype. Second, choose a team that ensures you have the required skills as well as work

ethic. Although working with friends seems simple and appealing, make sure you understand group dynamics and responsibilities. Lastly, make sure you make progress weekly or have plans in place.

[redacted]
Engr110
03.18.25

I will start this reflection in the place that singularly and most notably distinguishes this particular class from others, which is the valuable time spent with and diligently working to help our community partner. [redacted], and the entire [redacted] family were absolute delights and truly wonderful individuals to collaborate with. I am extremely happy and pleased to say that we have successfully developed a great and meaningful relationship and our dedicated group will continue to iterate on our challenging problem (and additionally help them fix some old devices that need attention) even well past the conclusion of this class. Throughout my academic journey, no class has ever previously allowed me to connect so deeply and profoundly with the product I am making as working closely with [redacted] has. I have always lived under the general assumption that my most meaningful and impactful work would inevitably come in the practical application of my engineering classwork, not in the actual classwork itself. This enlightening class definitively proved me wrong in that assumption. Engineering specifically for the sake of helping others is and should undoubtedly be the ultimate goal of all meaningful work in this field.

As per the detailed process itself, our motivated group got off to a relatively slow and somewhat delayed start as various unexpected illnesses (particularly on my part) and complicated scheduling conflicts unfortunately prevented the entire group from sitting down with [redacted] and properly presenting our initial ideas for the assistive device. Given this significant gap in our timeline, we methodically prepared a variety of potential options, carefully narrowing them down based on essential factors such as cost considerations, overall effectiveness, and likely user adoption rates. We were subsequently presented with additional unforeseen difficulties as our traditional presentation methods (typically preparing detailed descriptions and visual presentations) posed challenges since [redacted]'s limited visibility required us to thoughtfully adapt our communication techniques. To appropriately accommodate this important consideration, we creatively developed a comprehensive series of physical low-poly prototypes constructed out of readily available cardboard materials. Through this tactile approach, he was far more easily and quickly able to connect with and properly conceptualize and confidently decide on a course of action, and from that promising point onward we were enthusiastically off on our development journey.

Once [redacted] (quite enthusiastically) chose the innovative [redacted] device concept, we extensively tested a variety of cardboard prototypes to meticulously decide on the optimal shape, properly align with [redacted]'s personal wheelchair configuration, and thoroughly test various guiding geometry options for maximum effectiveness. Using the [redacted] materials we specifically purchased for testing purposes, we rigorously tested these preliminary prototypes on a variety of different surface types (including natural grass, smooth concrete, rough asphalt, etc.). We also at this critical stage discovered the significant [redacted] weight issue, which made it far too easy to accidentally push away instead of smoothly sliding onto the collection pan as intended. We thoughtfully accounted for this unexpected challenge by including several of the [redacted] in a sealed plastic bag to strategically increase weight and provide necessary inertia for proper functionality.

After that comprehensive initial testing phase, we confidently moved onto the more advanced metal prototyping stage, which involved precision bending and careful cutting of durable metal materials. Here we were able to methodically iron out the exact shape of our front bend (creating a more amicable and effective surface for collision and implementing a slight functional ramp for the poop to slide smoothly to the back of the collection pan). We successfully achieved this specific design element by initially bending it as far as the automated machine would allow, then subsequently inserting it in the manual press apparatus to achieve the precise

final angle required for optimal performance. Finally, we carefully drilled in prospective holes for secure mounting to the wheelchair. Once this crucial metal plate component was thoroughly prepared, we extensively tested its fitment underneath the chair and from those valuable observations adjusted to our optimized final dimensions for production.

Once definitively deciding on the ideal size and functional form factor, I meticulously modeled the plate in Onshape utilizing the specialized sheet metal tools available in the software. From that detailed digital model, using the sophisticated master modeling system, I systematically developed the rest of the necessary geometry for the completed device. This comprehensive design work included creating a variety of specialized 3D printed parts specifically meant to properly sturdy the overall geometry and securely mount it to the wheelchair frame. From there I efficiently 3D printed all the required parts in the well-equipped Lab64 facility or alternatively on my personal 3D printer when appropriate for smaller components.

After all individual parts were completely finished, I carefully assembled them using hardware specifically purchased locally (including standard 3/8in bolts and various related mounting hardware). Once thoroughly done with the assembly process, we proudly presented this refined version of the functional prototype to [redacted] for his honest opinion and real-world testing of the device!

Overall, without any reservations, this meaningful project was an absolute delight and incredibly rewarding experience. I genuinely enjoyed the challenging engineering work itself, the unique opportunity to partner directly with the wonderful [redacted]s, and the engaging class as a whole. I thoroughly liked and appreciated the informative lectures themselves and found many of them to be thoroughly engaging and highly educational. That being said, for me personally, the heart and soul of this particular class was undeniably the hands-on project and the profound connections formed during its development.

[redacted]
ENGR 110
March 20, 2025
Course Reflection

Looking back on this quarter, I believe this class has significantly contributed to my design process and abilities. In many of my previous courses, my design and build processes were focused on creating a product I personally wanted. Designing for someone else introduced a unique and rewarding challenge, requiring me to merge my own ideas with another person's desires to develop something that could meaningfully improve their life. This new design perspective was eye-opening as it required me to think like someone else and imagine what they would want. Beyond this, I learned that I also have to anticipate what the person needs but did not ask for. The opportunity to work on an assistive device for [redacted] allowed me to grow not just as a designer but also as a communicator and collaborator.

One of the most valuable aspects of this class was learning about the different types of assistive technology already in existence. Gaining an understanding of current solutions provided me with a foundation and context for my own design work. In addition, listening to the personal stories presented in class about how assistive technology had helped their lives gave me a more personal perspective, which helped me stay motivated in my project for this class. I thought it was also important to gain insight into what students with disabilities on Stanford's campus experience and what they have found to be the shortcomings of care provided by the university. I thought the assistive technology fair was also extremely fun. It is evident that creating assistive technology that is marketable to a mass audience is quite difficult, so seeing what niches others have identified and getting their perspectives on my project was insightful. I thought talking to the founder of the Lotus Ring and the gentleman from the Silicon Valley Independent Living Center (SVILC) was particularly enlightening. The Lotus Ring really emphasized the importance of simple design to solve complex problems, and SVILC gave useful feedback.

One of the most enjoyable and useful parts of the class was talking with Dave in individual meetings. The guest presenters each had their own unique perspectives, but Dave doesn't often share much about his assistive technology experience with the class. However, I found that he has seen, tested, and created a lot of different assistive technology, and his insights from those experiences are interesting and unique. He has more experience than anyone in the class and even many of the presenters. I wish we had heard more about those experiences and his thoughts. We get a small taste of his thoughts when he asks questions of the presenters at the end of class. I think something fun Dave could add is something like an "assistive technology of the week" at the start of class, where he could share and comment on a new technology he found or just something he finds particularly interesting.

In terms of the design we made and our design process behind it, the most impactful experience was our interactions with [redacted]. Since she was the one we designed for, her opinion was really the main one that mattered at the end of the day. It was evident that [redacted] enjoys working with teams to create new things for her wheelchair. She knows what she wants and loves helping us make something she needs. She provided fantastic feedback to allow us to refine our final design. She gave us guidance while still giving us the creative freedom to explore unique solutions to her problem.

If I were to do this project again, I would make meeting with [redacted] a high priority. I would try to meet with her every other week. While scheduling conflicts can make this difficult, more meetings would only help us improve our design. The most important advice I would give to anyone taking this class in the future would be to meet

with your project partner as much as possible. They are who you are designing for, and therefore, their input is the most valuable.

To wrap up my thoughts on this class, I really enjoyed my experience. I would definitely recommend this class to other students. I think it was a great experience as an engineering student to design and produce something for someone else. I felt very prepared to be successful in this class. I could see how people with limited design experience could find it challenging, but I think the support is there for anyone to be successful. I think Dave has put a lot of work into the class, and it shows. The class is enjoyable and provides lots of room for personal and professional growth. I am really happy with the product my team created and hope that [redacted] is also very happy with it. I hope it works well for her and that she can use it for years to come. Thank you for a wonderful class.

[redacted] Individual Reflection:

ENGR 110/210 - Perspectives in Assistive Technology was a fantastic course which offers insights into the lives of people with disabilities and the technology which they choose to use in their everyday lives. The varying perspectives, from young to old, from students to professionals - the course helps show that our idea of disability is not quite what we may think. The project gives a wonderful opportunity to work directly with a community partner and gives us a chance to potentially make their life even a little bit better.

The ability to work directly with the community partner, and involve them throughout the design process, allows the ideation and design process to really keep them in mind every step of the way. [redacted], the community partner that I worked with, is a professional in every sense of the word and provides enough of her perspective to make us well-informed to her needs but not so much that it fully controls our end product - by the end, we still feel immense ownership over the solution.

Seeing the examples from previous students allowed us to see the expectation for scope and seeing the "professional" technologies let us see just how far we could take this stuff. The presentations also allowed us to see just how wide-ranging assistive technology can be.

When taking on the task of designing a lighting solution for [redacted], it was very clear that our starting point was her. We visited [redacted] to get a feel for her needs and expectations for the solution. Getting to hear her story and riding her many types of wheelchairs was a great plus!

Our design process was largely independent of the rest of the course once we got started, mainly because of how responsive and helpful [redacted] was and the deep experience of the team. All four of the Radiant Rollers are seniors in mechanical engineering and have designed/manufactured many products so we were quite comfortable with all the steps in the process. And with [redacted] as a resource, we were confident we could produce something of high quality as well as something that remained true to her needs.

After our initial meeting, [redacted], [redacted], [redacted], and myself all decided to individually brainstorm solutions for the sake of going as wide and broad as possible. It was at this point when we performed our own research into what was already available on the market as well as what solutions we could think of.

When coming together, we had a strong mix of solutions. Some straightforward, some complex. Some using only off the shelf components, some fully custom. We discussed the pros and cons of each solution based on the wants and needs of [redacted], the class budget/timeline, and our desires for the project. We also did group brainstorming to try and catch any potential solutions and details we might have missed. By the end of the meeting, we had a solid list of ~4 solutions which we could build upon and present for feedback.

Drafting up a document with summaries for all of them, we decided to send it to [redacted] to get some preliminary feedback. With the help of her (and Dave's) analysis, we were able to select an idea to move forward with the lighting box. With this solution, we were able to create a novel product to solve the problem which took into consideration her day-to-day operations.

Building upon that to make a prototype with modules for all the components we were looking to integrate, we set up a follow-up meeting with [redacted] to answer some of our final questions. With this meeting, we looked to nail down a footprint for the lighting box to ensure that it could fit on both wheelchairs, would be of adequate height for her seated position, and could be stored within her backpack. With the help of this meeting, we were able to make the final product.

Our process was very good at allowing us to explore a wide range of possibilities while also making sure we were on track with the user/engineering requirements set during our meetings with [redacted].

Looking back, I think we could have benefitted to move a bit quicker in the beginning in order to get some feedback from the teaching team before the final solution. While it was nice to have a sort of unveiling moment at the very end, the feedback the team gave was very good and could have been of use earlier on.

Aside from that, I am very happy with the product we presented and the process which we followed. The course as a whole was a fantastic experience and very powerful in terms of deepening my understanding of user experience and user needs.

Thank you to Dave, Lance, and Mathilda for the great quarter.

[redacted]
ENGR 110: Perspectives in Assistive Technology
3/19/25

Reflecting on my experience in the ENGR 110, I have gained a deeper understanding of the critical intersection between design, empathy, and engineering. Throughout this quarter, the hands-on nature of the class, alongside interactions with users, professionals, and instructors, has made this journey incredibly rewarding and educational. I have learned not only how to think through and solve real-world design challenges but also how to be a better collaborator, communicator, and problem-solver.

The design process for the [redacted] Project, in particular, was a fascinating journey. It all began with understanding [redacted] specific needs for a wheelchair rain protection solution for both herself and her service dog. Through this project, I saw firsthand how essential it is to start with a user-centered approach. [redacted]'s willingness to share her experiences and challenges allowed me to tailor the design more closely to her needs, highlighting the importance of engaging with the user early on and often. The design process itself, from brainstorming and conceptualization to prototyping and testing, underscored how critical iteration is in creating an effective solution.

One of the most valuable parts of this experience was the structured interactions with the guest lecturers, community members, and the diverse group of professionals who shared their insights. Dave, Lance, and Mathilda, thank you for leading such an enriching class. Your guidance through the technical and human-centered design processes made each step more approachable and meaningful. In particular, Dave's discussions on the importance of accessibility in engineering design really challenged me to think beyond the technical aspects and consider how designs can truly improve lives. Lance and Mathilda's support during the prototyping phase was crucial in troubleshooting and refining the design, making me realize how collaboration can enhance outcomes.

The most rewarding interaction was with [redacted], as her openness and willingness to allow me to help in designing a solution made the entire process feel purposeful. Her input throughout the prototype testing helped me better understand how to balance functionality with comfort, particularly when dealing with the added complexity of her service dog's needs. The process would not have been as impactful without [redacted]'s feedback.

If I were to go through this process again, I would certainly allocate more time to the testing phase, ensuring that prototypes are iterated upon with more immediate user feedback. While the process of background research and initial prototyping was valuable, I believe additional support during the initial idea development stage could have further honed my approach to solving the design problem more effectively. I also wish we had a bit more time to reflect on user feedback and iterate upon that feedback in a more accelerated manner. To future students, my advice is to listen attentively, stay patient, and approach the process with empathy - user input is key, and the value of their perspective cannot be overstated.

In conclusion, this class has reinforced the importance of integrating technical knowledge with a user-centered mindset. The ability to empathize with the user and understand their unique needs has been one of the most valuable lessons from this course, and I am grateful to have had the opportunity to apply it in a real-world context.

Thank you again, Dave, Lance, and Mathilda, for your leadership and support, and a special thank you to [redacted] for trusting me to contribute to your solution.

[redacted]
ENGR 110: Perspectives on Assistive Technology
17 March 2025
Individual Reflection

I first saw ENGR 110 while browsing the list of Mechanical Engineering technical electives on the ME student site. However, I did not seriously consider taking the course until I talked to some past students at Meet the Makers last winter - they had fabricated a lap desk to be used with a wheelchair and had taken the time to raster the Stanford logo on the desk. When talking to these former students, they mentioned one of the most fulfilling aspects of the course was being able to directly fabricate something for a person - if done well, they would directly have an impact on an individual's quality of life.

I had the privilege of working with an incredible individual that is quite involved with disability advocacy and the broader disabled community. Our goal was to create a universal water bottle and phone holder that would work on all four of her very differently structured mobility devices. On our team's first visit to her house, she showed us many devices that she uses in her daily life, as well as her design issues with them. Even one of her powered wheelchairs that she uses daily has a very inconvenient plug location. I was also shocked that the company no longer supports that wheelchair due to it not being covered by Medicare - if a critical part were to break, she might not be able to get a replacement. This practice of companies reducing or removing support on older products in favor of new ones was a common trend through many of the devices our community partner used, including a reading magnifier. Based on these experiences, my team wanted to ensure that our project process included frequent check-ins, testing, and opportunities to receive feedback from our community partner. It's easy to design something for yourself and your understanding of the problem. Without user interviews and frequent sessions of user feedback, it's possible to fall into a trap where the end product does not actually solve the user's problem.

After our initial interview session with our community partner and trying all of her mobility devices, our team brainstormed key concepts separately. We also developed 5 key design criteria - the device needed to 1) securely attach to all mobility devices, 2) securely hold the water bottle and phone, 3) not interfere with wheelchair use, 4) be durable and repairable, and 5) have the "coolness factor." We sent these sketches to our partner for review. Based on her feedback and team discussion, we selected our top three ideas that we felt would best meet our design criteria. From there, we developed a rough prototype that would validate the main design choices – after testing, we confirmed that the device was attachable and usable with all four mobility devices, which I felt was our project's greatest challenge.

From there, we used our fabrication skills to create a more robust and aesthetically pleasing final prototype. One of my team members designed a honeycomb frame, which we printed together, and I sewed the fabric casing, pockets, and straps that complete the rest of the design. We made sure to have our community partner select fabrics that she gravitated towards – we purchased a variety of samples in her favorite color. I enjoyed being able to apply the design principles and fabrication skills developed in the rest of my ME degree to this project. In many ways, this design process felt a lot less rigorous and constrained than some of my other ME courses, as it was a lot less focused on defining and satisfying specific requirements. I think that made the process much more enjoyable and I'm very happy with what was produced. The smile and excitement of our community partner made everything more than worth it.

One of my team members had less fabrication and design experience than the rest of the team. I was challenged by trying to balance teaching her skills and having this be a learning experience with my general timeline constraints. I was in two other project classes this quarter and suffered a head injury about halfway through that

significantly hindered my ability to think, focus, and use screens. She focused on more of the user interview process, which she had experience in, but another team member and I ended up doing most of the physical design, fabrication, and documentation of the prototype to save time. Although we did our best to include her throughout the process and explain where possible, I do wish the workload could have been more balanced and I could have spent more time teaching her.

I was also not expecting to enjoy the guest speaker aspect of this course so much. I truly felt I learned an incredible amount. I think I came into this course with a somewhat monolithic view of disability, which I attribute to a lack of exposure to individuals with disabilities and the wide range of disabilities that those individuals can have. Assistive technology is ultimately such a broad term. The glasses I'm using to write this are a great example, and I'm not sure I would have immediately thought of glasses as assistive technology at the beginning of the course. We all use assistive technology to experience and navigate the world. Hearing from a wide range of individuals (such as on the student panel) as well as my head injury this quarter reminded me that not all disabilities are visible – our world and systems today are still very unfriendly to different ways of navigating them. Our field trip to the Magical Bridge Playground showed how small design choices that may seem insignificant (such as a consistent and predictable arrangement of structures on the playground) can make such a huge difference in accessibility.

I also loved the many examples of cutting-edge assistive technology explored by the guest speakers and shown at the Assistive Technology faire. The brain-computer interface that enabled quadriplegic individuals to interact with screens and speak stuck with me. I loved the penguin robot Momo intended to help teach kids with autism how to better read emotions and understand social situations. Also, the braille keyboard that enabled private texting for the visually impaired solves a problem I hadn't even thought about. Lastly, if I ever have that much extra money, I might buy the smart oven that uses infrared light to cook your food.

One of the speakers, Monroe Kennedy, said that the more advanced robotic systems and technology become, the more you have to consider the user and whether the system is actually faithfully carrying forward the user's inputs and intention. This user-based focus is the main point I'll take away from this class – I hope that everything I design in the future doesn't stray from this focus.

Overall, this course was incredibly eye-opening and introduced me to both a variety of experiences and technologies. This is a course that everyone looking to build and design products and systems should take. It is ultimately an exercise in listening to and better understanding people's lived experiences – a skill that all designers, students, and humans should practice.

Final Reflection:

This class was really impactful on my perspectives on disability both personally and in a general sense. I think starting off, I was nervous about my lack of skill in the class especially since the group I settled on was one with two mechanical engineering seniors, [redacted] and [redacted], and that was intimidating. My experience working with them was nice and I learned a lot about collaborative work. Beginning off with the process was a bit overwhelming. In design courses I am typically put into groups with hard set deadlines and check-ins and the flexibility of this class did not provide that layer of security, instead it helped to organize our time independently and offered a lot of freedom. Additionally, periodic reminders at the beginning of class sessions from Dave were also really useful and helped us remember important portions of the class like the midterm presentation. We used a group chat and would often message one another after class.

This class was also my first push to use the PRL space for the first time. We used room 36 in Huang, staying away from things like wood-cutting and instead used the room with the 3D printers and other smaller more craft-like tools. I do not know how to 3D print, so it was a learning curve and I learned a lot from watching [redacted] and [redacted] when making our first prototype, but I was happy that I was also able to bring some of my own expertise to the project. When making our original prototype, [redacted] and [redacted] struggled a bit more with using more craft-like materials instead of printing things so I was able to use my ideas for things like Velcro as well as using foam core as a cheap alternative for the base that we would 3D print for our final prototype later on. It was an idea I got from my Design 11 class since my first project in that class required the use of a lot of foam core. I learned skills like sewing and installing grommets as well and me and Laura spent a lot of time together installing the grommets since we had to troubleshoot the installation process due to the hammer not being sufficient enough with force to lay the grommet flat.

I was also able to bring my design experience to engineering spaces because while [redacted] and [redacted] were focused more on building the internal base, I spent a lot of time talking with [redacted] and came up with the questions we used to interview her since it was a skill I learned from previous design courses. I developed a good relationship with [redacted] and we were both able to relate on our experiences with disability and she also gave really good advice on pain management at some point! It was also really nice to show up to her house and get baked goods every time (she is an excellent chef). Design teaches us to document our work and process, and there is a large segment of my camera roll dedicated to [redacted] and [redacted], taken during various conversations and tests as well as photos in the PRL (many are candids since I wanted to naturally document the process).

I also spent a lot of time learning during the process of building our final prototype, specifically with things like heat inserts and sewing, and Laura and Tori were kind and allowed me to learn these processes with a lot of guidance and understanding of my lack of experience as a sophomore.

Ultimately, in this process I think I developed a deeper appreciation for the engineering process in realizing its closeness to the design process and the impact it has on others. I loved developing a close relationship with [redacted] and spending time with her as she gave us advice and feedback throughout the project as well as being able to learn things from my teammates without being made to feel ashamed by my lack of experience. I also liked reflecting on classes in relation to my own experience in the class with building a prototype and spent a lot of time reflecting on different parts of the engineering process. Classes like these are extremely important to take because they provide a taste of what the real world is like when working in careers like those developing assistive technology. Not only are you able to learn from experienced professionals, but Dave provided a lot of insight with his stories and reflections on his past with the VA. I hope to become more involved with this field in the future through independent studies and am taking this class as the first stepping stone of many in creating ripples in the field of assistive technology. As I continue in my design major, I will keep in mind everything I have learned and

plan to apply these skills and privileges of being able to work directly with the people I impact through my design and hope to work in effective teams in the future like my own! Thank you, Dave, Lance, Mathilda, [redacted], and [redacted], among many others! This class was informative, and I appreciated being able to have this learning experience.

[redacted]
Professor Jaffe
Perspectives in Assistive Technology
Individual Reflection

My ENGR 110 experience has been excellent. Working with team [redacted], [redacted], and [redacted] has taught me much about how to design for someone with a disability. Before going into this class, I had a decent grasp on designing around certain user requirements. For example, in my Design for Additive Manufacturing class, I designed a wrench whose geometry accommodated the use of a large, bulky glove. Small projects like these gave me a sense of designing around a user's restrictions but designing the water bottle opener for [redacted] shot my experience up tenfold.

There were many considerations to be made with [redacted]'s disability and the purpose of our project. The main design consideration was the fact that [redacted] had very limited mobility in both of his arms and hands. Although he was able to open an already-opened water bottle, he still struggled with that process. We had to make sure that our water bottle opener involved as little manual dexterity as possible. Brainstorming with my team about solutions was interesting, as our different backgrounds in engineering led to a wide range of initial design ideas. In particular, seeing the creativity my freshman teammates ([redacted] and [redacted]) had was really inspiring as a senior. We ideated back and forth between mechanical solutions and solutions that leveraged a more static approach. Based on our conversations with [redacted] and [redacted], we concluded that a single input actuation for our design would be the best for [redacted]. It wouldn't be complicated, and all [redacted] would have to do is push something to get the water bottle opened. Another insight we learned from our user research was that [redacted] also had limited vision. He preferred for his water bottle opener to be colored brightly. We factored this into our design as well, making sure to highlight the points where input was required with a bright red sticker. With all of these considerations taken into account, our final design, the [redacted] ended up becoming a project that all of [redacted] was proud to call our own!

Another valuable takeaway from this project was the team experience. Working with another senior in Mechanical Engineering and two freshmen made for a wonderful experience full of diverse ideas. In particular, I was not only impressed with [redacted]'s sketching and ability to ideate, but her dedication to learning how to design like an engineer. We spent many hours in the PRL, 3D printing, soldering, gluing, etc. It was fun seeing [redacted] and [redacted]'s reactions to the PRL for the first time as an ME student. Efrain and I also worked well together, taking all of the ideas and refining them into what would become our final project.

If I could do anything differently with [redacted], I would say that assigning team roles would have been a great help. ME170 allowed our teams to assign roles like Project Manager, Document Focal Point, and Engineering Requirements Manger. Once these roles were established, it was a lot easier to facilitate and assign tasks to different members of the team. For [redacted], it would have helped with our time management and designating certain tasks, but regardless, we pulled together as a team and produced a great design.

[redacted]
Engr 110
March 17, 2025
Engr 110 Individual Reflection

I previously took Chemeng 90Q Dare to Care: Compassionate Design taught by Professor Moalli. Similar to Engr 110, we also focused on designing assistive technology and hearing from potential users. However, these were only ideas, and we didn't get the opportunity to make them and test them out. When I heard about Engr 110, I was eager to continue my learnings from Chemeng 90Q but pair it with fabrication processes to improve someone's life. Working with the [redacted], I'm really happy that we made functional play equipment that [redacted] and [redacted] want us to continue with next quarter.

I really enjoyed all the guest speakers, especially since I get to learn something different each class. Hearing multiple people's paths to working in various assistive technology fields was really valuable to me and gave me some insight to what my life could look like after I graduate. One of my favorite lectures is Sha Yao's presentation on Eatwell. I've previously wondered how I could get ideas onto the market, and her journey making Eatwell products was really insightful. I also liked talking to various vendors at the assistive technology fair, and it was interesting how something as simple as a ring could be designed to do basic tasks. Additionally, I enjoyed seeing other teams' progress and their different design approaches in the midterm and final presentations. Although these didn't help my project directly, I've learned valuable information from the speakers and presentations that could aid me in the future.

The [redacted] project was really open-ended and we struggled to come up with ideas in the beginning. Many of our initial ideas stem from existing play equipment that we found during our trips to the playground and our own research. However, I came to like the open-ended project since we were able to make it as complex as we liked and turn it into a mechatronics project. [redacted], [redacted], and I were taking Mechatronics at the same time as this class, and we were eager to apply what we recently learned. Our previous experience with PRL classes helped immensely with our project and expanded our range of possibilities as well. I thought it was helpful that our [redacted] project has multiple parts that each person could work on individually. In my previous group projects, there were times when only one or two people could work on the project at a time while the rest would wait similar to an assembly line. For the flower table, when one person designs the buttons, another could work on programming the servos, and the third could integrate music.

One aspect I enjoyed about the project was designing the [redacted]r's linkage mechanism. I haven't worked extensively with linkages before, so I found it to be a fun challenge. The [redacted]r linkages that I saw online had multiple bars or were connected from the center of the flower. I wanted the linkages to be more subtle, so I designed a simple three bar linkage to be connected to the outside of the petal. I was able to improve my CAD skills and speed by forming the linkages and petals from scratch and testing out the linkage motions in CAD first saved me a lot of prototyping time. Even with this, the CAD motions weren't perfect since our actual flower prototype couldn't open all the way. However, the prototyping allowed us to improve our flowers for our final design.

I also appreciate how responsive [redacted] and [redacted] were when we emailed them for feedback as well as their connections to people in the Morgan Autism Center. We were able to improve many aspects of our design thanks to them. I especially enjoyed coming up with and designing different textures on the buttons in CAD, which is something we wouldn't have thought of on our own.

If I were to do this project again, I would ask the teaching team to help us brainstorm ideas. We mainly got feedback from [redacted] and [redacted] in the very beginning, and it would've been interesting to hear more people's thoughts before committing to a design. One advice I would give to new students is to explore the makerspaces on campus beyond the PRL. We found Lab 64 and Huang Makerbar incredibly helpful when the PRL was full of students. Another piece of advice would be to get more parts than you need as long as it's within your budget so that multiple people can work on those parts at the same time. Engr 110 was incredibly unique, and I am so grateful that I was able to take it.

Reflection on the [redacted] Project and Course Experience

This project has been an incredibly valuable learning experience, not only in terms of design and engineering but also in understanding the broader impact of accessibility in product development. It challenged me to think beyond conventional design constraints and consider how even small design choices can significantly affect a user's experience. The lectures on accessible technology provided a strong foundation for our work, helping us move beyond traditional design approaches and consider the unique needs of users like [redacted]. These lectures emphasized the importance of empathy-driven design, where accessibility is not treated as an afterthought but as an integral part of the design process from the beginning.

Learning about adaptive technology and accessibility from multiple perspectives - those of designers, engineers, and end users - was particularly enlightening, as it highlighted the importance of designing with, rather than just for, the people who will be using the product. Hearing from designers who specialize in accessibility gave me insight into how to make thoughtful, intentional design decisions that improve usability without compromising aesthetics or functionality. Engineers provided a more technical perspective, explaining how small modifications in structure, materials, and mechanics can drastically improve a product's adaptability for different users. However, the most impactful perspective came from end users themselves, who shared their personal experiences with accessibility challenges and the types of solutions that truly make a difference in their daily lives.

By integrating these different viewpoints, I gained a deeper appreciation for the collaborative nature of accessible design. This approach reinforced that accessibility is not simply about compliance or meeting baseline requirements—it is about creating solutions that genuinely enhance people's independence, dignity, and overall quality of life. These lessons were instrumental in shaping our project, pushing us to think beyond basic functionality and prioritize usability, adaptability, and user experience.

One of the most significant takeaways from the course was how accessible design is not just about solving a problem but about empowering individuals by giving them greater independence, agency, and opportunities to engage in the activities they love. Accessibility is not merely a technical challenge - it is about designing with empathy and ensuring that solutions enhance a person's ability to fully participate in their community. [redacted] is an active member of her community and a passionate artist, and our goal was to create a solution that would enable her to continue expressing herself creatively outside of her home without unnecessary barriers. The ability to take her art into public spaces, interact with fellow artists, and share her work with others is an important aspect of her identity, and we wanted to ensure that our design supported these experiences in a meaningful way.

The insights from the course lectures influenced our design decisions in several meaningful ways, particularly in understanding that accessibility is not a one-size-fits-all concept. Every individual has different needs, preferences, and challenges, so creating a rigid or overly specific solution would risk excluding potential users. Instead, flexibility and adaptability are key to ensuring that a product can be adjusted to fit the user's unique requirements and changing circumstances. This understanding led us to pursue a modular design approach, ensuring that the [redacted] could be customized based on [redacted]'s specific needs, the tools she prefers to use, and the environments where she plans to work. A modular system allows for different configurations, making it possible for [redacted] to adjust the angle, height, and position of the easel to maximize comfort and usability. Additionally, modularity ensures that the design can evolve over time, accommodating future needs or preferences rather than being a fixed, unchangeable solution.

The decision to make the project modular was also heavily influenced by discussions on universal design and inclusive engineering. One of the key lessons from the course was that accessible solutions should not be designed only for one specific individual but should have the potential to benefit a wider range of users. By focusing on adjustability and adaptability, we aimed to create a system that is not only accessible to [redacted] but could also be useful for other wheelchair users or individuals with similar needs. For instance, a portable, customizable easel could be beneficial for artists with limited mobility, individuals recovering from injuries, or even people who simply prefer a more flexible workspace. This approach aligns with the principles of universal design, which advocate for creating products and spaces that are inherently accessible to as many people as possible without the need for specialized modifications.

The course emphasized how well-designed accessibility solutions often have broader benefits, reinforcing the idea that inclusive design leads to better products for everyone. This realization shifted my perspective on product development, showing me that accessibility should not be viewed as a niche concern but as a fundamental aspect of good design. When products are built with inclusivity in mind, they tend to be more user-friendly, ergonomic, and adaptable for a wider audience. Through this project, I have come to appreciate that designing for accessibility does not mean making compromises - it means creating solutions that work better for everyone, ensuring that more people can engage in activities that bring them joy and fulfillment.

Beyond the technical and functional aspects, I found it especially rewarding to engage with accessibility from multiple viewpoints. Hearing from users gave me a deeper appreciation for the lived experiences of individuals with disabilities and how technology can enhance their independence. Learning from engineers and designers provided practical strategies for implementing accessible solutions, from material selection to ergonomic considerations. This multi-faceted perspective helped shape our approach to the project and deepened my understanding of the importance of accessibility in product design.

Overall, this project has been a meaningful application of the principles covered in class. It has reinforced my belief that good design is inherently inclusive, and that accessibility should be a core consideration rather than an afterthought. The experience of designing the [redacted] has given me valuable insight into how to approach accessibility challenges in future projects, ensuring that products are not only functional but also empowering for their users.

[redacted]
ENGR 110
Individual Reflection Essay
17 March 2025
ENGR 110 Individual Reflection

I first heard of this course through a friend who previously took the course, and had a great experience engaging with community members, while also being able to problem solve through the project. As someone who had always enjoyed building and tinkering with various mechanical parts, I was stoked to enroll and take on my own project. Coming into the first class, I had several project ideas in mind for what I might want to do with my team. However, when it came time for project sign-up, our top idea had already been taken, leaving us with what we thought would be the next best option. In selecting the [redacted] as our project partner, I was initially worried that the open-ended aspect of the project would pose a difficult challenge since there is no viable measure for the success of the device we build. Additionally, I was concerned that having to come up with our own ideas might place us at a time disadvantage. However, after completing the project and having the pleasure of showcasing our device on the last day of class, I can confidently say that I am honored to have worked with the [redacted] to create a collaborative and interactive device for the Morgan Autism Center. The success of this device can be attributed to the [redacted] and the Morgan Autism Center for providing us with valuable feedback on device criteria, Dave and the teaching team for the informative feedback on the device itself, and the team for our hard work.

Prior to visiting the [redacted], our team was unsure of the type of project expected from us and how we could help the community with our device. However, during the in-depth tour of the [redacted], [redacted] and [redacted] informed us of the differentiating aspects of the playground that promote inclusivity and provide accommodations. They further expressed their opinions on features and spaces they find lacking and would love to fill up, which we later used as our design criteria. From this, our team came up with several project ideas. After proposing them to [redacted] and [redacted], we simmered down our options to the [redacted] using a Pugh chart decision matrix. At this point, we were excited to work on the project, but we also had a lot of decisions to confirm - how many [redacted] should we have? What should the shape of the base be? Would it be feasible for us to add audio? How would we power everything? We immediately began ordering the parts we needed and dividing tasks among ourselves which included electronics, CAD, and manufacturing/assembly. Given the smaller size of our team, we were able to easily set up a common time weekly to discuss the progress of the device, as well as what needs to be done. Additionally, since we are all mechanical engineering students, we share a common skillset that allows us to help each other out, as well as provide insight for alternative ways we can implement different components. Overall, I believe our team worked really well together on this project–we all made good contributions.

Throughout the course, having heard from many guest speakers on assistive technology shaped the way I will approach engineering problems in the future. In many of our everyday devices, simple features can be implemented to make them beneficial for various groups of people with disabilities. Rather, they often seek design solutions that are most minimalistic and cost-efficient. One thing I learned in this course that has stuck with me the most was that assistive technology costs much more because of its low production volume. If many of our everyday objects are slightly modified to accommodate various disabilities, not only would assistive technology become more accessible, it would also become much more affordable. One of my favorite guest speakers was Sha Yao, the founder of Eatwell, as I found her story to be extremely inspirational. She was able to commercialize a product that she designed to address her mother's condition. She also talked about her process and struggles of finding suppliers, going through many iterations to accommodate the manufacturing tolerance

to perfect the end product. This is something that I hope to be able to mirror in the future and having an opportunity to discuss her experience was extremely valuable.

Overall, I really enjoyed my experience in ENGR110! I would like to express my gratitude to Dave and the teaching team, and all the guest speakers for providing insightful information on assistive technology, as well as [redacted] and [redacted] from the [redacted], and the Morgan Autism Center for their time and for providing the team with valuable feedback on our device. I am satisfied with the current state of our device and really enjoyed hearing all the positive feedback from my peers, as well as [redacted]. If I had to go through this process again, I would be less hesitant to select the [redacted] as our project partner, as the open-ended aspect of the project allowed us to input a lot of creativity into our device. For future students, one piece of advice I would give is to select a project that you truly are passionate about solving and start early! These two factors take part in attributing to our team's success. Looking forward, our team may potentially be interested in continuing this project with either the [redacted] or the Morgan Autism Center, as they have expressed deep interest in our device.

I heard of the ENGR 110 course, through my involvement in the field of AT at Stanford. I heard great things from my fellow peers who were doing research with me as well as from the PhD students who advised me! I decided to take this course with the hope to learn more about AT and eventually make something to help someone out!

My expectations at the beginning of the quarter were to build something cool and useful to help something out. My expectations were well met as my team and I designed a very great solution to the problem our user was facing.

My team was overall great, we all worked together to achieve a common solution - and I think teamwork is an important solution, especially due to the importance of teamwork in the workforce. Specifically, we were good at organizing a time that was good for all of us to meet, and effectively planning and executing the solution.

Our brainstorming sessions resulted in many creative ideas that resulted in innovative features that could be implemented in future projects outside the scope of this class. We spent a good amount of time testing and refining our design, making sure that every iteration was a step forward. This iterative process emphasized the importance of open communication and constructive feedback within our team, and solid communication led us to make developments fast. All of these prototypes have taught the team and I the importance of rapid prototyping and the development of each stage.

Throughout this journey, it became clear to me that collaboration was crucial. This process resulted in many great ideas throughout intense brainstorming sessions, but it became crucial that my teammates were those to rely on to run my ideas and feedback for our project.

Our team worked well so we had a lot of efficiencies in that area, but I do think organizing more times and meeting with [redacted] would be more beneficial. From this I can learn that time management is extremely important.

I conveyed my interest in this course to my friends, family, and research peers, and they all seemed super excited at what I was doing in the course, working with a user to design a solution for them. Some of the best reactions were from my research peers as they could relate to the process we allowed to come up with a solution, they just did it on a larger scale.

The most difficult thing was to adapt our solution with the materials we currently had to finish the solution. Additionally, sometimes there were nuanced problems with the design that we had to iron out. [redacted] is interesting due to her presence in the AT industry and all of the cool gadgets she has at her house!

What came naturally to our team was the role of each of the group members, some of us focused on the structural components while some of us focused on the CAD elements, an overall very collaborative process.

We did not encounter many challenges with my team; however, we did run into some scheduling issues once or twice.

This course has been transformative in that it has been great in preparing me for the real world, due to the amount of teamwork and independence we have had on this project. Additionally, it has been important to create our own timeline and keep track of the progress that was made.

I learned a lot overall from the course, from the speakers, and faculty. I would still love to learn more about the use of AI with AT, and how it may enhance people's lives. I have been exposed to perspectives in robotics,

neuroscience, and more! The lectures related directly to my project as the process for developing these solutions was extremely similar to the process we had to go through on a much smaller scale!

This class was an overall transformative experience as I got to utilize my learnings with a hands-on approach to tackling an issue and found this class super useful!

[redacted]
Winter 2025
ENGR 110: Dave Jaffe
ENGR 110: Final Reflection

ENGR 110: Perspectives in Assistive Technology helped me broaden my horizons on what assistive technology looks like and how it can help people with disabilities. The guest lectures were incredibly interesting and gave me new perspectives on the different aspects of assistive technology. One of my favorite lectures was the one about brain computer interface. I also really liked the lecture where we talked about prosthetics and wearable assistive technology. It was different and very interesting to think about the ways that technology can be implanted into our bodies. The discussions that were brought up from that lecture allowed me to continue to think about and process the assistive technology options that are available commercially.

During this quarter I had the pleasure of trying the Apple AR glasses. I had never tried a technology like this before, but because of this class, my mind immediately went to how this could be used as assistive technology. The way the Apple AR glasses work is they watch your eye movements to know what you want to do next. All you have to do is look at something on your screen and tap your fingers together and it selects that thing. The whole time I was using it all I could think about was how this could be so helpful for someone who needs a text to speech eye tracking program. I thought about the lecture we had where we talked about text to speech and eye tracking and could not believe that the technology had come far enough for this to be a device available to anyone. I tried typing on the Apple AR glasses and it worked quite well.

Another thing I loved about this class was the community partnership. Being able to work with [redacted] was about more than just making something for her. I loved learning about her life, the activism that she's a part of, and the challenges that she has had. I was so impressed by her resilience and her dedication to designing things for accessibility. She allowed me to have a better perspective on what it means for something to be accessible. Even just getting to use her wheelchairs around her home made me realize how hard it is to be a wheelchair user. I can now better appreciate the different design considerations needed for accessibility. In the future, I will definitely keep in mind the usability and accessibility of any design that I create.

In addition to working with [redacted], it was really fun to work with my team. Getting to know some of my peers in the class made everything much more enjoyable. My hope is that [redacted], [redacted], and I can continue to work together to further refine the design for the portable art easel.

If I were to go through the design process for this project again, I would like to do more iteration on the modularity of the [redacted]. I would also want to test it with different types of wheelchairs to see if the design could be universal. My advice to a future student would be to keep as much contact with your project provider as possible to ensure that they will like the design. Make them a part of the design process every step of the way. Using the resources available to you is incredibly important and useful as you continue your time in this class, ask for help early and often.

I would like to thank the teaching team for putting on an amazing course this quarter. I enjoyed every minute of every lecture and never missed a class. I appreciated the support on the project by both the teaching team and [redacted]. I cannot believe that this quarter is coming to an end, but I'm looking forward to seeing where this [redacted] design goes in the future.

[redacted]
ENGR 110
Reflection

ENGR 110 was truly an eye-opening course for me for two main reasons. As an engineering student, I naturally gravitate toward the technical side of things, and this class offered plenty of that. The lectures were fascinating, especially the ones that dove into the mechanics and biology of assistive devices. I particularly remember the lecture on exoskeletons - it blew my mind how engineering can be used to replicate or even enhance natural movement. Another standout was the lecture by Erin Michelle Kunz, Brain-Computer Interfaces for Communication. It made me realize how far technology has come and how deeply it can interface with the human body. But what truly made this class different from other engineering courses I've taken was the human-centered perspective it emphasized. I came into the course thinking primarily about the mechanics - how things work, how to build them - but I left with a new understanding of how people with disabilities actually experience the world. One lecture that really stuck with me was the one on cochlear implants. Before that talk, I had a lot of assumptions. I used to think that if someone had a cochlear implant, they could hear just like I do. I didn't know that these implants only allow the user to hear certain frequencies and that the experience of "hearing" through a cochlear implant is completely different from natural hearing. That realization shifted my perspective entirely - it showed me how important it is not just to design functional products, but to deeply understand the users they're designed for.

One of the most rewarding parts of the course was getting to work with [redacted]. Meeting her, talking to her, and learning about her day-to-day life was such a valuable experience. It wasn't just about designing for a "user"—it was about designing for a real person with specific needs, preferences, and routines. Our team really came together around that mission, and I feel incredibly lucky to have worked with such a dedicated and thoughtful group of peers. Everyone contributed meaningfully, and we pushed each other to do better at every stage of the project.

Designing something that could actually help [redacted] in her daily life was both challenging and inspiring. Our final prototype wasn't perfect - there are definitely some improvements we could make with more time - but I'm proud of what we were able to build by the end of the quarter. It's easy to get caught up in perfectionism, especially in engineering, but this course reminded me that even a rough prototype can have a real impact, especially when it's created with empathy and care.

Another highlight of the course was the project fair. One device in particular really stood out to me - it translated written text into tactile output, allowing people with visual impairments to "read" through touch. The engineering behind it wasn't incredibly sophisticated, but what impressed me the most was the intention behind it, it was about solving a real-world problem in a meaningful way.

What I loved most about ENGR 110 was how it brought together people, ideas, and engineering in a way that felt deeply meaningful. This wasn't just another class about circuits or CAD models; it was a course that challenged me to think differently about what engineering can and should be. It made me reflect on my own goals as a future engineer—not just to build cool things, but to build things that matter, that help people, and that respond to real needs in the world.

This course also helped me see the importance of accessibility in design. It's one thing to make something that works, and another thing entirely to make something that is truly usable and helpful to someone with a disability. That requires empathy, humility, and a willingness to listen - skills that I think are just as important as any technical ability.

In the future, I want to carry these lessons with me. Whether I end up working on assistive technology or in a totally different field, I hope I can continue to approach engineering from a human-centered perspective. ENGR 110 showed me that great design doesn't start with technology - it starts with people. And when you keep that at the heart of your work, you're more likely to build something truly impactful.

Overall, ENGR 110 has been one of the most meaningful and transformative courses I've taken. It taught me to be a better listener, a better collaborator, and, hopefully, a better engineer. I'm grateful for the opportunity to have been a part of it.

ENGR 210 Individual Reflection
[redacted]
3/11/25

My interest in exploring Type 1 diabetes (T1D) through assistive technology stemmed from a deeply personal connection - both of my grandmothers have Type 2 diabetes, and I have grown up aware of my own potential risk. This family history sparked my curiosity about T1D, which requires far more intensive management from an early age. I wanted to understand not just the medical aspects, but the lived experiences and psychological dimensions of managing T1D daily.

Throughout this quarter, the qualitative interviews with five individuals from diverse backgrounds proved most valuable to my design process. These conversations revealed insights that literature alone could never provide. A consistent theme emerged across all interviews: the pursuit of normalcy, though manifested differently across individuals. I discovered a fascinating paradox - those trying hardest to appear "normal" often feel most different, while those accepting their differences tend to feel most normal. The interviews shifted my perspective from seeing T1D as primarily a limitation to a condition people learn to integrate into full, active lives. The background research established a necessary foundation, but this knowledge became truly meaningful only when contextualized through these personal stories. While research showed technological advancements have improved physiological outcomes, my interviews revealed these same technologies often create psychological complexities around body image and visibility. The contrast between [redacted]'s positive outlook, shaped by supportive parents who "always put it in a positive light," and Martin's desire for privacy, highlighted how early experiences significantly influence one's relationship with a chronic condition.

Guest lectures from assistive technology professionals proved invaluable, which inspired me to think about how eyeglasses evolved from purely medical necessities to fashion statements and expressions of identity. This parallel helped me conceptualize how T1D management devices might similarly evolve beyond medical functionality to support personal expression. The brainstorming sessions following these inputs allowed me to process contradictions and nuances, revealing a fundamental disconnect between medical device companies' approach to "normalcy" (focusing almost exclusively on invisibility and discretion) and the varied needs of T1D individuals.

If I were to repeat this process, I would expand my interview pool to include more diverse socioeconomic backgrounds. While my current sample included geographical diversity (participants from the Philippines, South Korea, and the United States), access to advanced T1D technologies varies significantly based on financial resources. I would also incorporate more co-design sessions, inviting T1D individuals to participate directly in brainstorming and prototyping. While I gathered their input through interviews, more active collaboration could yield solutions more precisely aligned with their needs and preferences. The class's guidance on conducting ethical interviews was particularly helpful, especially regarding sensitive topics. Its emphasis on asking open-ended questions rather than leading ones improved the quality of insights I gathered. However, I would have benefited from more technical guidance on medical device regulations and constraints when developing potential solutions.

One significant challenge was balancing medical necessity with personal expression. T1D management devices must prioritize functionality and safety, often at the expense of user experience and emotional wellbeing. Finding the balance between these priorities required significant creativity. I also struggled with the accessibility implications of my design concepts. While customizable CGM accessories could benefit many users psychologically, they represent an additional expense that not all T1D individuals could afford, raising important questions about equity and access. Perhaps most surprising was how differently people conceptualize

"normalcy." For some, like [redacted], normalcy meant invisibility, influenced by cultural factors: "I think it's the Korean culture that prevented me from telling others about my condition. Koreans do not really talk about their struggles to others." For others, like [redacted], normalcy came through acceptance and integration: "I never saw it as a negative thing, but more like a part of me."

This project expanded my understanding of assistive technology design beyond functional requirements to include psychological and social dimensions. I've developed greater empathy for individuals with chronic conditions and recognized the substantial emotional labor involved in constantly managing one's health while navigating social perceptions. This experience reinforced the value of qualitative research in the design process. While quantitative data provides important metrics, personal narratives reveal the human complexity behind those numbers. Moving forward, the Expression-focused CGM Accessories concept could develop through partnerships with diabetes advocacy organizations and T1D influencers. Small-batch production using 3D printing could allow for personalization while keeping costs reasonable.

This project also highlighted the importance of community in managing chronic conditions. Nearly all interviewees expressed a sense of isolation and desire for connection with others sharing their experience, as [redacted] poignantly expressed: "I don't have a diabetes community, so I'm not surrounded by the sense of normalcy of it."

This project transformed my understanding of assistive technology design from purely functional considerations to addressing psychological and social dimensions as well. Through thoughtful design, we might help create that sense of normalcy, not by hiding differences, but by embracing them and transforming medical necessity into opportunity for self-expression and community building.

Individual Reflection: [redacted]
[redacted]
ENGR 110 Winter 2025

Project Overview

In ENGR 110, I worked on creating a water bottle opener for [redacted], who uses a wheelchair and has cerebral palsy. [redacted] has limited grip strength, reduced dexterity, and impaired vision- thus, the simple task of opening a plastic bottle becomes a daily challenge. The aim was to design a device that would afford more autonomy to [redacted] by allowing him to open bottles by himself, thus perfecting his ability to carry out daily chores without the intervention of someone else. The whole process has taught me so much-the technicality of assistive technology and, on another hand, the more human side of designing for people with disabilities. The whole journey, ranging from market analysis through user feedback to prototyping, opened my eyes to the complexities of molding functional, accessible solutions that would work efficiently for those with unique needs.

Market Analysis and Understanding the Problem

Beginning with a market analysis, to gauge what existing products were to be found for individuals like [redacted], it was very key in pointing out the gaps in the market. Many existing products to aid in the task of opening bottles demand an enormous amount of grip strength, fine motor skills, or two-handed operation. Those tools are too specialized, cumbersome, or just plain ineffective for someone like [redacted], with such a lack of dexterity. I learned the importance of comprehensively understanding the playing field before starting product development. A device that works for one user may not be readily accessible to the rest. This became apparent to us when we explored electric jar openers, requiring fine motor skills to activate. It clinched that these underlying products were not designed with people like [redacted] in mind, thus we must steer toward a much more simple and ergonomic solution working without fine motor control.

Design Ideation and Early Prototyping

In the market analysis, the brainstorming was put forward with so many design ideas. One early concept envisioned a turning-based system wherein [redacted] could apply force with his palm to turn the bottle cap, also utilizing a lever-style mechanism. But we learned soon enough that this design required too much dexterity beyond what [redacted] was capable of. Watching [redacted] move his hand became crucial: he could press with his palm but had trouble working his fingers individually. That led us to the model of the push design, where [redacted] pushes down on a button or surface to trigger the mechanism. We also liked the concept of a grip design that would hold the bottle securely in place without demanding much effort from [redacted]. This phase of design was a profound learning experience in empathy and user-centered design. I learned that not addressing the problem technically insufficiently; the device needed to physically align with [redacted]'s ability to interact with the world. Through the many brainstorming concepts, we generated several prototypes, testing out different ideas, and further refining them as per [redacted]'s feedback. Here, I have learned to stay open to changing the design whenever the latest insights come up. Every failure in the prototyping process brought us closer to finding a solution that would work for [redacted].

Prototyping and User Testing

Prototype development was the next phase of the project, making use of facilities in the Product Realization Lab. This was my first time operating a 3D printer, and it was simultaneously extremely easy and hard. I had to learn to turn our design ideas into 3D models and print them in a manner that would enable them to be used for

testing very quickly, as some designs did not go well according to plans initially. For instance, after some initial tests with our prototype, [redacted] wasn't able to test the bottle properly because it wasn't held securely. After improving upon the design, we realized that the device requires a more stable bottle holder. Some features were integrated to hold the bottle securely while [redacted] could put it in the mechanism easily. Testing it with [redacted] at this point became truly valuable. His hands-on input allowed us to optimize the design in real-time, ensuring we were designing a solution for his specific needs. Through this process, I recognized the importance of user involvement at every stage of product development. The best design solutions often come from working with the people who would be using that product. [redacted]'s insights into his abilities were instrumental in shaping the end prototype.

Personal Growth and Insights on Assistive Technology

The undertaking was not simply to design a bottle opener. The project was targeted at trying to comprehend the difficulties faced by people with disabilities and to understand how we, as future designers and engineers, could design products that would significantly impact people's lives. In India, where I grew up, I had an uncle who had to live in a wheelchair as a result of arrested growth. I watched him depend on others for almost everything most of the time. Back then, I could not grasp how terrible his life must have been. Probably due to having been raised with domestic help in India, I never understood what it meant to be quite dependent on others for your mobility. Working on this one modest assistive device made me see the life-changing effects it could have on someone like [redacted], who would have been supplied the chance of independence. This interaction gave me a perspective in thinking about assistive technology: designing for persons with disabilities is not just about solving problems; it is about restoring dignity and independence. It also gave me inspiration about technology helping to improve the quality of life for people living with mobility interference. Along with gaining insight at a personal level, I acquired technical skills important for my future work. I learned how to operate a 3D printer, how to do user-centered design and testing, and how to adapt a product from a real-world point of view. Most importantly, I learned that the design process is rarely linear; it is a journey that involves perpetual iteration, learning, and empathy.

Guest Lectures and Broader Perspectives

From the guest lectures in this course, I have gained a further broadened understanding of assistive technology. One particular class that resonated with me was given by a Berkeley professor talking about the history and evolution of wheelchair designs. The technologies associated with mobility devices gave me a clear picture of the progress that has been made and the difficulties that lie ahead in the works of accessibility. The design for [redacted]'s wheelchair accessories and [redacted]'s design of accessible playgrounds also gave me a broader understanding. [redacted] is an artist despite mobility challenges, whereas [redacted]'s design focuses on inclusive play spaces, displaying that assistive technology is not only about functioning but about securing a better quality of life, setting them up for opportunities to engage with the rest of the world.

Final Thoughts and Advice for Future Students

The guest lecture series for this course further broadened my knowledge of assistive technology. One guest lecture, in particular, delivered by a Berkeley professor who spoke on the history and evolution of various wheelchair designs, struck me. The technologies of mobility devices have given me clear insight into the progress so far and the problems ahead in the realm of accessibility. In addition to this, the design of [redacted]'s wheelchair accessories and [redacted]'s design of accessible playgrounds greatly broadened my understanding. [redacted] is an artist with mobility challenges, while [redacted]'s design is based on inclusive play spaces. Both examples demonstrate

that assistive technology concerns not only functionality but also securing a better quality of life for the application of opportunities to interact with the rest of society.

ENGR 110 was one of the most eye-opening classes I've taken at Stanford. Unlike other engineering courses that are all about technical problem-solving, this one really made me think about the human side of technology - how assistive devices actually fit into real people's lives. It wasn't just about designing something that worked in theory; it was about creating something that made a tangible difference for someone. That shift in focus made the class feel way more meaningful and gave me a new perspective on engineering.

Our project - [redacted] - ended up being a lot more complex than I initially expected. At first, it seemed pretty straightforward, but once my team and I started thinking about things like adjustability, user preference, and ease of use, we realized how many small details could make or break the design. The most valuable part of the whole process was working with [redacted]. Visiting with her and seeing her navigate daily life with mobility impairments firsthand was an entirely different level of understanding than just reading about accessibility challenges. She had so many different assistive technologies integrated into her daily routine, and it was clear how essential they were. Watching how she moved, how she interacted with different devices, and how even small design changes on our project could make her life easier was a game-changer. Her feedback really helped us shape our approach, and it made the project feel very personal in a way I didn't expect.

As for the team, we worked well together for the most part, but there were definitely moments where we had different ideas about how to approach things, which isn't necessarily a bad thing. The biggest challenge was making sure we weren't jumping straight to solutions and trying to solve the problem for [redacted] without fully considering how they would work for her. By the end, we found a good balance that [redacted] approved of, and it was a solid experience in teamwork and communication.

Overall, this class changed how I think about engineering. It's easy to get caught up in just the technical side, but if a design doesn't actually work for the user, it doesn't matter how innovative it is. ENGR 110 made me realize that assistive technology is about more than just solving a problem - it's about designing with real people in mind. That's something I'll carry with me for the rest of my life. Thank you.

[redacted]
March 19, 2025
ENGR 110, Winter 2025
ENGR 110 Individual Reflection

ENGR 110 has been an immensely rewarding and educational experience, providing me with the opportunity to grow both technically and empathetically as an engineer. I would like to extend my sincere gratitude to Dave Jaffe, Lance, Mathilda, my project coach [redacted], and all donors who made this course possible. Their guidance and support have been instrumental in creating a meaningful learning environment where I was able to explore the human-centered aspects of engineering while working on impactful projects aimed at improving the lives of others.

Throughout this quarter, I engaged in a comprehensive engineering process that included attending lectures from various professionals and assistive technology users, conducting interviews with community members, performing technical need-finding, completing background research, engaging in fabrication, and managing projects and documentation. From the introduction of the project to the presentation of our final prototype, the process was thoughtfully streamlined while still allowing us the creative freedom to develop innovative solutions. I greatly appreciated the open-ended nature of the project, where establishing deliverables, checkpoints, and meetings was a collaborative effort between our team and our project coach.

While the course was a positive experience overall, I believe certain aspects could be enhanced. Specifically, the number of lectures could be reduced, as many presentations covered overlapping content. The combination of extended lecture periods and the late class time was also not conducive to effective learning. I recommend breaking class sessions into shorter, 30 minute segments and incorporating additional time for breakout discussions or brief breaks for refreshments to enhance engagement and knowledge retention.

Additionally, considering that the majority of participants were mechanical engineering majors, I found that there was a limited emphasis on mechanical engineering topics. More discussions focusing on how mechanical engineering principles can be applied to developing assistive devices, similar to Professor Monroe Kennedy's presentation, would be a valuable addition to the course.

I am also appreciative of the flexible structure of the course, particularly given that I was simultaneously enrolled in other project-based classes. The absence of rigid assignments allowed our team to allocate our efforts effectively and produce high-quality work by focusing on tasks when we were most prepared to do so. Our team operated with minimal oversight, collaborating well and fabricating components primarily on weekends. While there were occasional disagreements due to increasingly demanding schedules, we maintained a respectful and professional environment, successfully pushing through challenges.

Reflecting on our workflow, I believe implementing a formal "I want/I wish" list during the first week of the project, similar to the ME Capstone approach, would help teams establish clear priorities, goals, and expectations before diving into the work itself.

If I were to approach this project again, I would dedicate more time to concept selection following our initial interview with our project coach. Our team developed a basic pros and cons list for each concept, but this process could have been refined to improve decision-making. Additionally, I would prioritize acquiring the necessary materials as soon as our idea was finalized. The ordering process was time-consuming and plagued with shipping issues, which delayed our progress. Establishing a dedicated, reliable mailing address for

mechanical engineering project classes, beyond Buildings 520 and 530, would greatly enhance efficiency and provide a secure, dependable means for receiving essential materials.

In conclusion, ENGR 110 has been an incredibly valuable experience that has broadened my perspective on engineering and its potential to positively impact lives. The course's emphasis on creativity, collaboration, and empathy has enriched my approach to engineering design and project management. Moving forward, I intend to apply the lessons I have learned in future projects and continue to grow as an engineer dedicated to both technical excellence and human-centered solutions.

ENGR 110 Individual Reflection
By: [redacted]

I discovered this course through its listing as a technical elective for the mechanical engineering major. I chose to take it because it aligned with multiple interests of mine: engineering and disability awareness. I expected the course to involve designing a project, and that expectation was well met. Not only did we complete our project, but it turned out to be something I am genuinely proud of.

My project involved designing and fabricating a universal water bottle and phone holder for [redacted]'s four mobility devices. I worked alongside two other students, Laura and Lina, as we navigated the design process from concept to final prototype. The project required interviewing [redacted], conducting background research, analyzing existing solutions, brainstorming with our instructor, fabricating, and testing. While each stage was necessary, some steps were particularly critical in shaping our final design.

Interviewing [redacted] provided direct insight into her needs and constraints, streamlining our design process by eliminating unnecessary guesswork. Additionally, analyzing existing products allowed us to identify common failure points and improve upon previous designs rather than starting from scratch. However, the most valuable phase was fabrication and testing. While theoretical analysis can predict outcomes, physical testing exposed design flaws and material limitations that were not immediately apparent. Iterative testing allowed us to refine the design, optimizing structural integrity and usability in real-world conditions.

One of the most significant challenges was ensuring structural integrity while maintaining adaptability across multiple mobility devices. I was responsible for designing and fabricating the internal frame of the holder, while another team member focused on the external fabric components. Given my background in flexible plastics, such as TPU 95, the one we ended up selecting, and finite element analysis (FEA), I took the lead on structural considerations. To ensure durability, I implemented a safety factor of four. However, because the frame exceeded standard print bed dimensions, I had to divide it into sections and rely on adhesive bonding. This introduced shear strength concerns, which required careful joint design to mitigate potential failure points. Evaluating different bonding methods helped to refine the final assembly process.

Managing the project timeline proved to be another challenge. One of our team members had significantly fewer foundational skills than the rest of us, making task distribution uneven. While I recognize the value of mentorship, the fast-paced nature of the quarter left little time for skill development. This experience reinforced the importance of prerequisite coursework to ensure all team members can contribute effectively. Courses such as ME 102, ME 103, and optionally ME 127 should be required to improve fidelity of final prototypes and to ensure that all team members have a sufficient technical foundation to contribute meaningfully to the project.

Despite these challenges, one of the most rewarding aspects of the project was [redacted]'s reaction to our work. Frequent feedback sessions allowed us to refine our design and hearing how the final product could positively impact her daily life validated our efforts. The project also deepened my understanding of accessibility considerations. [redacted] shared challenges I had not previously considered, such as the difficulty of finding van-accessible handicap parking in the mornings. These insights broadened my perspective on real-world barriers beyond just physical device compatibility, emphasizing the need for engineers to consider the broader ecosystem in which assistive technology functions.

The skills developed in this course directly relate to my career goals. I intend to work in surgical robotics, which, at its core, is a form of assistive technology. The user-centered design principles reinforced in this project - gathering direct user feedback, iterating on prototypes, and addressing real-world constraints - are essential in

developing medical devices. Additionally, balancing theoretical design with practical fabrication underscored the importance of manufacturability, a key consideration in biomechanical engineering. The need to translate conceptual designs into functional, scalable products is critical in medical device development, making these skills directly applicable to my future work.

While this course focused primarily on physical accessibility, it raised questions about how assistive technology can be extended to individuals with invisible disabilities. The intersection of engineering and disability studies presents numerous opportunities for innovation, and I am interested in how similar design principles can be applied to broader challenges. For example, advancements in wearable technology and sensor-based systems could provide real-time support for individuals with conditions that are not immediately visible but still significantly impact daily life.

Ultimately, this course provided hands-on experience in developing solutions for real users, reinforcing both technical skills and design empathy. The lessons learned—particularly in structural analysis, user feedback integration, and material selection - will inform my future work in engineering. This project strengthened my ability to approach complex design challenges with a combination of analytical rigor and practical problem-solving, skills that will be critical as I pursue a career in biomechanical engineering. Moreover, it reinforced the importance of designing with, rather than for, end users - an approach that is essential in creating impactful and effective assistive technologies.

ENGR 110 Winter 2025
[redacted]

When I first signed up for this course, I did so because it seemed unique and somewhat unexpected as an elective option for economics majors. I had no prior experience with assistive technology and had not previously engaged with individuals with disabilities in a meaningful way. However, looking back, I can confidently say that this course has been one of the most rewarding academic experiences I have had. Hearing from professionals in the field, engaging with users, and working hands-on to develop a solution opened my eyes to an area of design and accessibility that I had not previously considered.

One of the most impactful moments of the course was interviewing our community partner, [redacted], and his brother, [redacted]. Prior to this experience, I had not deeply reflected on the daily challenges faced by individuals with disabilities. Hearing about [redacted]'s struggles while also witnessing his optimism was eye-opening and thought-provoking. It prompted me to reflect on my own life and consider how different perspectives shape our experiences. His input was huge in shaping our design decisions and reviewing his past experiences with assistive technology helped us refine our approach to better meet his needs.

The design process itself was both challenging and rewarding. Initially, my team faced difficulties coordinating meetings and maintaining effective communication, which at times felt frustrating. I often found myself taking on additional responsibilities, such as handling emails, coordinating with Dave, and completing the majority of the midterm report and slides. After our midterm presentation, I felt that our work could have been stronger. Therefore, I shared my concerns with my team, and from that point forward, our communication improved significantly. We met more frequently, collaborated more effectively, and ultimately became a cohesive team. This shift was a turning point and made the second half of the project both productive and enjoyable.

One of the highlights of the course was working in the PRL. Teaching my teammate, [redacted], how to use the bandsaw and learning from seniors Luis and Efrain about soldering was incredibly rewarding. It was a full-circle moment, once being the student and now being able to guide someone else.

Our initial brainstorming sessions were challenging, but once we developed momentum, ideas flowed continuously. At one point, I kept proposing different concepts until the EE majors on our team recognized the potential in one of them. From there, we sketched designs, built an initial prototype out of cardboard, and quickly realized its limitations. We then pivoted to 3D printing, which required me to relearn CAD after several years of not using it. My teammates helped me relearn the software, and together, we created a new prototype that we presented at Dave's after-hours session. The feedback we received was helpful and greatly improved our final design.

Reflecting on the course, the interactions with others in the course played a huge part in our project's success. Conversations with [redacted] and [redacted] provided direct user insights that ensured our design remained practical and user-centered. Discussions with professionals, even when unrelated to our specific project, broadened my understanding of the assistive technology industry and its potential for innovation. I also appreciated the hands-on, problem-solving nature of the course, which offered a refreshing contrast to my more theoretical coursework in economics.

If I were to repeat this experience, my recommendations for future students would be to start early, maintain a steady workflow, check in with the TAs and Dave regularly, and invest time in building strong relationships with teammates. I only truly connected with my team members toward the end of the project, and I now recognize how beneficial those relationships could have been from the start.

One of my key takeaways from this course is the importance of teamwork and effective communication. I also learned that setbacks and failed prototypes are integral to the design process, but with adaptability and perseverance, solutions can always be refined. This experience has influenced how I approach problem-solving and has given me a newfound appreciation for user-centered design.

I would like to extend my sincere gratitude to Dave, the TAs, our community members, and all the guest speakers who shared their knowledge and experiences with us. This was my first project-based course, and I can genuinely say it has been one of my favorite classes during my freshman year. Thank you so much!