Individual Reflections

ENGR110/210

Perspectives in Assistive Technology

Winter 2026








This document consists of twenty-eight Individual Reflections from students who worked on assistive technology projects in the course. Seven teams consisted of three or four students and there were two Individual Projects.

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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Individual Reflection: Engineering for Inclusion through [redacted]

03/16/2026

The Value of the Design Process and Learning by Doing

Looking back on this past quarter, working on the [redacted] device pushed me beyond just thinking about mechanical engineering in theory and into actually practicing user-centered design. The article "Learning through Structured Reflection" discusses reflection as grounded in real knowledge and experience, and I saw that play out in how we balanced hands-on work with learning from real situations.

One of the most unexpected and rewarding parts of the project was making the treat bag. As a mechanical engineering student, I'm used to CAD and working with rigid materials, so sewing was completely new to me. Taking it on myself, I had to figure out things like fabric tension and durability. We ended up adding metal flex frames at the opening so [redacted] could easily access the treats. When we finished, I was honestly proud of how it turned out. It looked like something you could actually buy, and that mattered. An inclusive device shouldn't feel like a piece of medical equipment. It should fit naturally into someone's life.

The Impact of Interaction and Inclusive Perspectives

The different interactions we had throughout the course helped shape how I think about design. Working with [redacted], who originally suggested the project, was especially important. She helped us translate real needs into clear engineering goals. Visiting the Magical Bridge Playground really stuck with me. It showed what true inclusion can look like in practice. Instead of separating people with disabilities, the space was designed so everyone could participate together. That experience shifted how I saw our project.

We weren't just building a treat dispenser. We were contributing, in a small way, to making someone's daily experience easier and more enjoyable.

BCI and Assistive Technology

The guest lectures also expanded my perspective, especially the one on brain-computer interfaces (BCI). It challenged how I think about assistive technology. Before, I mostly saw it as mechanical solutions, but BCI showed how it can go much further, even enabling direct communication through the brain. Seeing what's possible for people with severe physical limitations made our project feel connected to a much larger effort to improve accessibility and independence.

These lectures helped me understand that what we were doing, something as simple as designing a bag, fits into a much bigger picture. I started to see disability less as an individual problem and more as something shaped by systems and design choices that we can improve.

Community, Joy, and Growth

At first, things like the burrito party or having snacks in class didn't seem that important, but they actually played a big role in our team dynamic. Those moments made it easier to connect, share ideas, and think more creatively. Some of our best ideas came out of those more relaxed settings.

If I were to do this project again, I would spend more time early on really understanding the user's day-to-day experience. The bag turned out well, but I've learned that the strongest designs come from fully understanding the person you're designing for.

Advice for Future Students

My advice for future students is to take reflection seriously from the start. Don't just focus on building, pay attention to the stories, the guest speakers, and the bigger context. The technical skills you gain are important, but the empathy you build is what actually drives meaningful engineering.

[redacted]

ENGR 110

3/12/2026

Individual Reflection

This course pushed me to grow not just as a designer, but as someone who thinks more deeply about the people technology is meant to serve. Our project began with a literature review of existing assistive technology solutions, relevant research papers, and available sensor options. As a team, we met over call to align on our game plan, deciding which electronics to purchase and how to divide the work. While my teammates took ownership of the wiring and code, I took on the CAD design responsibilities.

I completed my PRL training certification for this class and dove into fabrication. It brought back memories of a tech workshop I had loved in high school. I designed my first sensor case, printed it, and tested its fit on the wheelchair during one of our class sessions. The results were humbling: both the sensor case and speaker case fit poorly. This was an early and important lesson, as real hardware has real constraints. I researched alternative fastening solutions and found hex nuts in the PRL, then located a screw site with STL files for the correct thread pitch and diameter. After testing a few options, I landed on a fastening system that was not only a better fit but significantly more durable for wheelchair use.

With the mounting problem solved, I returned to CAD with a clearer picture of what the design needed to do. I redesigned the sensor case to sit on top of [redacted]'s flashlight, molding a dip into the base to conform to the flashlight's shape and adding holes to let the light shine through. The result was clean and functional. Meanwhile, on the electronics side, the team established a working LiDAR and ultrasonic sensor connection and developed a state machine for the code as the quarter progressed. After extensive preliminary testing of signal and voice output, we had one evening test session with [redacted] where everything came together and the product worked really well.

Hearing from a wide range of pioneers in the assistive technology field helped shape my outlook throughout this process. While I already had some familiarity with visual impairment, exposure to speakers working in web accessibility, wheelchair testing, and brain-reading typing interfaces was genuinely eye-opening. Although these talks didn't always directly inform our design decisions, it was energizing to witness the breadth of innovation in the field, and the assistive tech fair was a highlight as well.

That said, meeting with [redacted] and [redacted] was easily the most valuable part of the entire design process. No matter how elegant a CAD design looked on paper, it meant little if it didn't fit [redacted]'s actual needs. Early sensor case designs seemed perfectly reasonable in isolation, until I learned that [redacted]'s wheelchair locks into a van mount and that earlier iterations were obstructing his flashlights. Those kinds of constraints simply cannot be discovered in a lab.

Early conversations with Dave also helped orient our team toward the right literature and existing solutions from the start.

The most rewarding moment of the entire project came when [redacted] and [redacted] were taking measurements of the wheelchair and suggested moving one of the sensor cases above the flashlight. That small suggestion signaled that they were comfortable with the placement, and it unlocked a meaningful step forward in the design.

If I were to go through this process again, I would prioritize scheduling far more frequent check-ins with [redacted] and [redacted] and gather many more measurements across different areas of the wheelchair early on to make the CAD work more efficient. On the electronics side, I think our team could have achieved several of our stretch goals had we ordered parts earlier and done deeper research on sensor options, avoiding the architectural bottlenecks that limited what we could accomplish. My advice to future students: treat every Sunday as your product deadline. If you are consistently pushing out iterations and prototypes each week, you will reduce end-of-quarter stress and arrive at a much stronger final design.

In terms of team dynamics, I was fortunate to work with talented people. We had an electronics expert, a coding expert, and me handling CAD. That said, team composition and coordination matter enormously. Some teammates were seniors or juggling significant outside responsibilities, which made scheduling and alignment a persistent challenge. There were moments when I found myself coordinating more than felt sustainable, and occasionally carrying more of the workload than I had hoped. But these are the natural imperfections of any team. When we did get in the same room, our sync was excellent, and we worked with real efficiency. The challenge was simply getting there. Future teams should factor in teammates' other commitments early and establish clear expectations around availability from the start.

Finally, the guest presentations truly opened a window into the forefront of assistive technology. One of the most memorable was Ralf's lecture near the end of the quarter. His story and his mission around wheelchair design were genuinely moving. And throughout all of it, Dave's passion for the field made every interaction worthwhile, and the cookies didn't hurt either.

Thank you, ENGR110. I can say with confidence that this will be the best assistive technology course you take at Stanford.

[redacted]
ENGR210
03/20/26

Individual Reflection

Over the course of the quarter, ENGR210 felt like two parallel experiences that worked really well together. On one side, we had the team project, where we worked with the Magical Bridge Foundation to design and build a gear table. On the other side, we had lectures, guest speakers, and class fairs that gave us a much broader view of assistive technology and inclusive design. I really liked that structure. It made the class feel grounded in real work while also pushing us to think beyond just our own project.

The most valuable part of the process for me was definitely the project itself. Working with a real organization like Magical Bridge made the class feel much more professional than most others I have taken. It did not feel like we were just completing an assignment for a grade. It felt like we were actually contributing to something real and working alongside people who cared deeply about the outcome. That made the work feel more meaningful and made me take the design process more seriously. Our decisions were not just about what would be cool to make, but what would actually make sense for a real place and real users.

That said, the other parts of the process were still important. Background research, looking at prior solutions, brainstorming, and talking through ideas all helped us build a foundation before jumping into fabrication. They gave us a better sense of what already exists, what kinds of interactions feel intuitive, and how we might shape our own design. Brainstorming was especially helpful early on because it gave us space to explore without committing too quickly. We were able to swing all our ideas by [redacted] and [redacted] and followed through with the ones they were most excited about.

Fabrication and testing, though, were where everything became real. Once we started actually building the gear table, we had to deal with all the things that are easy to ignore when an idea only exists on paper: scale, durability, clarity, and whether people would actually want to interact with it. That was one of the most valuable parts of the class for me. Building the prototype was not just about making the final product. It was one of the main ways we learned. It showed me that making is part of thinking, especially in design.

The different interactions we had throughout the class played a huge role in shaping the final result. The most helpful and rewarding were definitely our interactions with [redacted] and [redacted] from the Magical Bridge Foundation. Their involvement is what made this project feel different from other school projects I have done. They were engaged, supportive, and genuinely invested in what we were doing. They gave us direction, but they also helped us understand the bigger context around the project. I do not think we would have had the same success or learned nearly as much without them. Their participation made the whole process feel more real.

What I appreciated most was that they brought a perspective we could not have gotten from research alone. It is one thing to read about accessibility and inclusive play, but another thing entirely to talk with people who are actively thinking about those ideas in practice. That helped me realize that inclusive design is not just about meeting requirements or making something technically accessible (ADA-compliant). It is also about making something inviting, intuitive, and enjoyable to use.

I also really appreciated the guest speakers. Some talks connected more directly to our project than others, but I still found value in all of them. They brought in perspectives that we do not usually get in other engineering classes, and they expanded the conversation around disability and assistive technology in a way that made the class feel broader and more thoughtful. I liked the duality of having an ongoing project while also hearing from people working in so many different corners of the field. The project gave us depth, and the speakers gave us breadth.

Another big part of the experience was my team. At the start of the project, I had only met [redacted], so it was really rewarding to get to know a new group of people and become a close team over the quarter. Working as a team was challenging at times, but ultimately really fun and rewarding. There were plenty of late nights in the PRL, lots of problem-solving, and fun visits to the Magical Bridge playground in Palo Alto. I felt like everyone contributed in their own way, and that our different backgrounds and perspectives made the project stronger. By the end, it felt like we had built both a prototype and a solid team dynamic.

If I were to go through the process again, the main thing I would do differently is spend more time on user testing and iteration. We did some preliminary testing with students, which was useful, but I think it would have been much more valuable to get the prototype into children's hands and actually observe the target users interacting with it. That would have given us better feedback and probably led to a stronger next iteration. I also would have loved the chance to build out a larger-scale version after learning from that testing.

Even so, one of my favorite moments came from a smaller, informal kind of testing. We left the prototype out in the PRL, and it was fun to watch curious students walk over and immediately start playing with it. They began linking the gears and figuring out how it worked without any instructions. That was exciting to see because it suggested that the design had a kind of intuitive pull to it, which felt like a really good sign.

Overall, I thought the teaching staff and course structure were strong, especially in the way they made the class feel collaborative, open-ended, and connected to real people. My advice to future students would be to really lean into the relationships that make this class different. Take the community partner seriously, prototype early, and do not be afraid to test things before they feel finished. A lot of the best insights come from watching people interact with what you made, not from trying to perfect it beforehand.

Individual Reflection - ENGR 110 - Winter 2026
[redacted]

I decided to take ENGR 110 because my interest in engineering has always stemmed from the possibility of helping people. Developing assistive technology for community members not only allows for a workflow that is new and very different from traditional engineering classes, but also requires continuous feedback from a real person based on real-world use rather than a professor based on project requirements. This involves changing timelines and new manufacturing processes - both of which were unusual to me.

My team was composed of 3 mechanical engineering students. Since we were all used to project-based classes where instructions are very straightforward, specifications are fixed, and manufacturing processes are usually limited to 3D printing and laser cutting, it took us a few weeks to understand that we should design for a person rather than show our engineering skills. Our initial solutions all incorporated mechanical systems and were meant to be 3D printed. After speaking with [redacted], she pointed that out to us and asked us to investigate other potential manufacturing methods. This was when we turned to sewing - something none of us had ever done for a class, but which ended up being a clearly better choice for this project. This taught me about designing to fit user needs and keeping an open mind.

For this reason, I believe that interacting with [redacted], our project suggestor, was the most valuable part of the class and what most contributed to the results of our project. She gave us very valuable information on her needs and feedback on our sketches, prototypes, and final design. In addition to that, she also gave us great feedback on our design processes, which will be useful beyond this class. She helped us stray away from the "easy" way and what we are used to, she taught us about communicating with project suggestors (which can translate to clients), and much more.

The class speakers were also incredible to listen to and a great source of knowledge. It was great being able to learn from people who work towards the same objective - helping people - and in the same space - assistive technology - but in such different manners. It opened my eyes to possible career opportunities I had not previously considered, such as starting a company in this space, working with innovation within a larger organization such as Stanford Health, or even teaching, like Dave!

Something else that was very interesting in this project was looking at existing products that, in theory, would serve [redacted]'s needs. It was interesting to analyze and understand the reasons why seemingly simple and well elaborated solutions are actually not accessible for large portions of the population. Existing solutions tend to over-rely on mechanical systems, work only for specific types of treats, or use excessive zippers for small openings, which are difficult to manipulate for people with limited dexterity. If I think beyond our project with [redacted], I can actually think of many other applications of the solution we developed using metal frames - for example, for my grandparents to carry their essentials such as IDs, important documents, and their phones, with easy access.

If I were to go through the process again, I would communicate more with [redacted], our project suggestor. All of the feedback and input we got from her was extremely useful, so getting more of it would be incredible. She was also always very receptive to us at her home and made us feel very welcome and comfortable, so our visits were always a great experience that brightened our weeks. If I were to advise future students, I would tell them to pick a project they are truly interested in, with a suggestor they would like to work with. I would then tell them to keep an open mind in terms of solutions and processes to use - my team tried something new, and we ended up with a product we were very proud of and which [redacted] seemed to like a lot too. There is always room to learn new skills, so there is no need to restrict yourself to what you already know - learn something new!

Overall, I really enjoyed this course. It was very different from the courses I was used to, which made it even more interesting to me. I got to learn different types of information: more technical content from some of the speakers in class, as well as life stories from other speakers. I learned more about [redacted], learned new skills through the project, and came up with a product that will actually help - and be used by - someone, which is surprisingly rare in the mechanical engineering major and the reason why I decided to study this in the first place. This class allowed me to move away from the technicalities of engineering and move closer to what I want to do in the field, which is to help people have access to devices and tools that make their lives healthier and easier.

[redacted]
ENGR 110, Winter 2026

I initially took this class because I wanted to make a real-world impact with users who I could get to know, familiarize myself with and create personal connections. I expected this course to be as fast-paced as the capstone, with immense engineering requirements to accomplish, and this did startle me a bit. Instead, this course exceeded my expectations and placed more emphasis on establishing connections and identifying user needs and wants, implementing those into a design. Not to mention, the course went beyond explaining technical details, instead focusing on assistive technology user accounts of these designs. By moving beyond the technical fabrication of a prototype and viewing our work through a social lens, I have learned that engineering is as much about people as it is about parts we create.

The most valuable aspect of this course was interacting with and interviewing community members. Whether it be our project suggestors or the guest speakers, they left me with additional considerations and greater insights into how to further develop a project. Interacting with the people who would actually use or be affected by our design shifted my perspective from designing for a population to designing with them. Early in the quarter, our team had several assumptions about what the problem was. After speaking with our project suggestor, though, we realized the importance of one-on-one interviews to clarify the needs of our user.

One specific interaction stands out as the turning point for our design. During an interview with our project suggestor, [redacted], they pointed out a usability flaw that none of our team members had considered. Essentially, we were aiming for a mechanically-driven device to fulfill [redacted]'s needs, though we neglected to come up with designs that reflected the simplicity she wanted. This misconception was created since [redacted] had previously shown us a past device that another ENGR 110 team created for her. This device contained mechanical components to them, and based on her descriptions, we aimed for similar ideas. Fortunately, we resolved these errors with more specific questions about what would best fulfill her needs.

To this end, I would say that since brainstorming and conducting interviews were most effective at understanding [redacted]'s needs, the prototyping stage was not as valuable. We created one pouch prototype that fulfilled most of [redacted]'s needs, with our final design just being a touch up of the original. If anything, we gained the most insight from the previous stages.

As for other class interactions, I thought the speakers were extremely inspiring and motivating in presenting the gap in technology they found and addressing these gaps, even when others did not take them seriously. In writing this, I am most reminded of Olenka's speech during the Magical Playground trip. She emphasized that even when the law and guidelines said that playgrounds would be accessible enough for her daughter, they still weren't; rather than accept defeat, she aimed to find a solution for increasing the inclusivity of playgrounds, which I thought was inspiring. The same goes for other stories such as that of Ralf's during the last lecture, in which he spoke about his journey creating simplified-manufacturing wheelchairs for underdeveloped countries. I thought his lecture was the most moving, especially considering

that I have relatives in the countries he worked in. What these stories ultimately conveyed was that there is a solution for most any problems presented; it is only a matter of fighting systemic barriers that make these issues long-lasting in the first place. While I would not say they were informative in creating designs for our project, I did find them informative for needs finding in users, specifically those we worked with.

If I were to go through this process again, I would front-load the community engagement even further. I realized that we spent perhaps too much time researching pre-existing solutions before actually talking to [redacted] and hearing about what she wanted. Nonetheless, our team had decided it would be more useful to brainstorm ideas with her in person, mitigating any issues with online communication. I thought this was more effective, and in the future, I would treat community interviews as the primary research; instead, I would use scholarly articles to support what I hear, rather than the other way around. Throughout the process, what came most naturally was brainstorming and sketching ideas, which [redacted] appreciated as it provided her with many available options. In this way, she could pick and choose what she wanted in her final design, ensuring her preferences were accounted for in our product.

If I were to take the class again, another objective of mine would be to talk to the guest speakers more often and stay after class to learn more about their experiences in crafting assistive technologies. Overall, I genuinely enjoyed this course and in future work, I will ensure to make accessibility a priority as well as focusing on user needs.

ENGR 210 Winter 2026 Individual Reflection - [redacted]

Participating in ENGR 210 was a profound exercise in stepping outside my comfort zone, both technically and personally. Our team's objective was to build a drop-off detector for [redacted], a powered wheelchair user who navigates complex terrain. Going into the quarter, I had very little context regarding the space. Because of this, the background research phase proved to be the most critical early step for me. Without that initial deep dive into the landscape of existing solutions and the daily realities of visually impaired wheelchair users, our engineering efforts would have lacked a clear, empathetic direction.

One of my most significant takeaways from the design process was the stark contrast between software and hardware development timelines. Coming from a background more aligned with software and tech, I initially operated under the assumption that we could assemble and finalize our prototype in just a few weeks. The reality of physical fabrication was a humbling lesson in iteration.

While we successfully built a functional prototype that detected drops and delivered audio warnings, the process took significantly longer than anticipated. We ended the semester without hitting all our intended milestones, such as full battery integration. This experience highlighted how unforgiving hardware can be; every adjustment to a physical casing or sensor mount requires time that simply cannot be rushed or debugged with a few keystrokes. Nevertheless, seeing the final, functional tool come together was incredibly rewarding and gave me a newfound respect for the physical engineering process.

The most transformative aspect of the course was our direct, continuous access to our primary user. Having [redacted] attend classes frequently meant we were never designing in an academic vacuum. Engineering assumptions often fail when they meet real-world user habits, but our regular conversations with him provided the precise details we needed regarding what he actually wanted and needed. This immediate feedback loop fundamentally changed our perspective and helped us prioritize the right features, like focusing on immediate, distinct audio warnings over unnecessary complexities.

This human-centric approach was echoed by the guest lecturers. I deeply appreciated that the speakers did not merely present clinical data or engineering specifications as they brought their authentic selves and a palpable passion for their work. It served as a constant reminder that the ultimate goal of assistive technology is to restore dignity, safety, and agency.

A structured reflection requires stepping back from an experience to analyze it candidly, which brings me to the most challenging and uncomfortable part of the quarter: my role within the team. Due to a heavy schedule, being off-campus, and lacking deep experience in building physical systems, I struggled significantly to contribute to the fabrication process. [redacted] brilliantly took the lead on prototyping and CAD, [redacted] drove the electrical engineering, and [redacted] contributed greatly to coding the system. Watching my teammates shoulder the bulk of the hard engineering was a difficult pill to swallow. Despite giving my best with the bandwidth I

had, I found myself experiencing, involuntarily and for the first time, what it means to be a “free rider.” I felt terrible knowing my teammates were picking up the slack when I could not deliver at their level.

If I were to go back and restart this project, I would fundamentally change my approach. Knowing my limitations in physical prototyping, I would have aggressively front-loaded my contributions in the early stages, taking on the brunt of the research, initial planning, and any software components, to ensure I was pulling my weight before the heavy mechanical lifting began. This was a difficult but invaluable lesson in self-awareness, communication, and resource allocation within a multidisciplinary team.

Reflecting on the course itself, ENGR 210 is highly self-driven. While autonomy is valuable, the project outcomes could be more equitable if the teaching staff actively assigned teams based on experience levels and disciplines. I noticed that teams comprised of seniors or co-term students with deep mechanical backgrounds naturally excelled, whereas less experienced teams faced a much steeper climb… at least in my POV. A more balanced distribution of expertise would alleviate some of the pressure on students who find themselves suddenly responsible for unfamiliar hardware tasks.

For future students taking ENGR 210, my primary advice is to come prepared with some level of mechanical design experience, or partner strategically with someone who has it. In the current technological landscape, coding is no longer the bottleneck it once was. AI models can now write and debug code rapidly. The true, unavoidable challenge in this course lies in physical integration, 3D modeling, and mechanical reliability.

As someone building a career in AI and tech, this course provided a vital new perspective. While the vast majority of our project options heavily indexed on hardware and physical devices, the potential to address assistive needs through AI is massive. Moving forward, I am keen to explore how software and AI can be integrated into the physical tools being built today. ENGR 210 has not only taught me the rigors of hardware design but also has firmly bridged my professional interest in AI with the tangible, human-centric world of assistive technology.

[redacted]

Individual Reflection for ENGR 110

One of the most valuable parts of the course for me was hearing from the guest professionals who visited our class. The speakers were incredible and provided insight into how engineering can be applied to solve real problems in the world of accessibility and assistive technology. Listening to them inspired me to consider working in the engineering of accessible devices in the future. I was particularly drawn to this area because there is so much room for creativity when designing for unique user needs. At the same time, the work directly helps people and contributes to making the world more accessible. Two speakers who stood out to me in particular were Peter W. Axelson and Frank R. Willett. Frank Willett spoke about his work developing brain-computer interfaces that translate brain signals into commands for computers and devices. These systems allow people who are paralyzed to communicate and interact with technology using only their neural activity. Hearing about his work was extremely inspiring because of how transformative it could be for people who have lost the ability to move or speak. It showed me how cutting-edge engineering can directly restore independence and communication. Peter Axelson's talk was also very impactful. He discussed the wide range of products he has developed for wheelchair users, including adaptive sporting equipment, airplane wheelchair transportation solutions, and standards for accessible trails and sidewalks. What stood out to me most was how his work demonstrated the same design process that we practiced in class. He described how ideas evolve through cycles of ideation, prototyping, testing, and iteration. Seeing how those methods led to real-world products reinforced the value of the engineering design process that we were learning.

Interviewing community members and users was another critical part of the project. As engineers, it is easy to believe that we can predict what users need or what problems should be solved. However, this project showed me that there are always aspects of a user's experience that cannot be fully understood without direct conversation. Talking to [redacted] helped our team see challenges from a perspective we would never have been able to imagine on our own. Hearing about her daily experiences and watching how she interacts with her environment helped us identify design considerations that we initially overlooked. These conversations reminded me that effective engineering solutions must begin with empathy and a deep understanding of the user. Background research and investigating prior art were also important parts of the design process. By examining existing solutions, we were able to understand what had already been tried and what worked well or poorly. This helped us avoid repeating mistakes and allowed us to build on ideas that had already proven effective. One phrase that guided our thinking during this phase was "all design is redesign." Rather than starting entirely from scratch, we analyzed previous designs, kept the elements that worked well, and modified the rest to better meet [redacted]'s needs. This approach helped us refine our concept and move forward with greater confidence.

The most important stage of the project, however, was fabricating and testing a physical prototype. Creating something tangible allowed us to test our ideas in the real world instead of relying only on theoretical concepts. By physically attaching our prototype to [redacted]'s

wheelchair and observing how she used it, we were able to identify practical issues that would not have been obvious otherwise. Testing the prototype revealed adjustments that needed to be made in terms of positioning, stability, and usability. Without a physical prototype, it would have been impossible to evaluate these aspects effectively. Another rewarding aspect of the project was seeing how different design ideas could help [redacted] in different ways.

Throughout the process, we explored multiple potential solutions, and each version addressed a different aspect of the problem. Seeing how each design iteration contributed something useful was encouraging and showed how engineering progress often happens through gradual improvements rather than a single perfect solution. If I were to go through this process again, the main thing I would do differently is begin prototype testing earlier. Starting the testing phase sooner would allow more time to iterate and develop multiple versions of the design. Each round of testing reveals new insights, and earlier testing would give the team more opportunities to refine the device and better tailor it to the user's needs. Overall, this course was extremely valuable for me because it showed how engineering design can directly impact individuals and communities. It reinforced the importance of user-centered design, iterative prototyping, and collaboration with people who have different perspectives and expertise. Most importantly, it demonstrated how engineering can be used not just to build technology, but to create solutions that improve people's lives.

Final Course Reflection: Perspectives in Assistive Technology

I first learned about ENGR 110 during my sophomore year and kept it on my radar ever since, especially after talking with a Course Assistant in the Product Realization Lab (PRL) who shared how the class immerses students in the full assistive technology development process. I decided to enroll because of my long-standing interest in Human-Computer Interaction, design thinking, and building human-centered hardware. This interest was deeply personal; having served as a caregiver for my grandmother, who had limited mobility, and for my younger siblings, I have seen firsthand how the right tools can fundamentally alter a person's independence. My background in mechanical fabrication through courses like ME 102 and ME 103, where I gained hands-on experience with CAD and 3D printing, positioned me well for the team project track, but I expected the class to go beyond just building. I wanted to learn how to design with users, not just for them, and move into R&D roles that serve real human needs.

Throughout the quarter, one of the most valuable aspects of the course was the opportunity to collaborate with people from varied backgrounds and skill sets. In engineering, it is easy to get siloed into technical thinking, so working across disciplines was a vital reminder that a product is only as good as the diverse perspectives that built it. This was reinforced by the guest speakers, particularly those who live with disabilities themselves. Hearing them speak about how their disabilities affect their daily lives shifted my understanding of "good design" from a purely functional metric to a human one. I particularly enjoyed hearing from Sha Yao about her journey creating Eatwell. Her presentation highlighted the rigorous, often overlooked backend of innovation, the endless rounds of interviewing, observing, and documenting required to turn a concept into a viable business. It served as a grounding reminder that you don't just wake up with an idea and put it on the market; you have to do the work of empathy first.

The hands-on process of working with [redacted] to create the [redacted] [redacted] detector was challenging in a way that truly tested my engineering growth. As a Mechanical Engineering major, exploring the electrical side of the project, integrating VL53L8CX Time-of-Flight sensors and managing power circuits, stretched my technical boundaries and forced me to think about how hardware and software must "handshake" effectively. We learned that creating a product results in continuous prototyping, often going back to the drawing board after every meeting or testing session. For instance, our midterm report highlighted a major pivot where we realized the front of the wheelchair was not ideal for [redacted]'s specific needs, leading us to move the sensors to the side. This iterative cycle proved that in assistive technology, the user's feedback is the most critical part of the design process.

Working with [redacted] also taught me that an "elegant" engineering solution is useless if it doesn't align with the user's identity and lifestyle. His specific request for the device to be pink and "not look overly medical" was a powerful lesson in cosmesis. It reminded me that assistive technology is an extension of a person's personality, not just a clinical tool. We also had to manage the "cognitive load" of the device, ensuring the audio alerts were clear but not overwhelming, as false positives could quickly lead to a loss of trust. Ultimately, this course has deepened my ability to translate technical ideas into meaningful solutions and reinforced my

passion for living at the intersection of empathy and innovation. I am now more prepared than ever to apply my skills to creating assistive technologies that measurably improve quality of life.

Over the course of this quarter, the project for the class and the uniqueness of working with community members made for an engaging process and opened many doors for learning opportunities. Working with my group as a whole was a great experience, as we took on the creative challenge of collaborating with Magical Bridge, knowing it would be more open-ended than some of the other project options. In doing so, I believe we really challenged ourselves to actively listen to what they wanted and ensure that the final delivery of our project was suitable to their needs, while also staying within the scope of our goal of enabling accessible play.

A huge takeaway for me was learning how to design for a specific user group. In previous project-based classes, I was often working toward a clearly defined end goal or designing something based primarily on my own assumptions and preferences. In this situation, however, I had to learn how to take constructive feedback from real users and translate it into meaningful design decisions. This shift in perspective was one of the most valuable aspects of the course. It required me to step outside of my own viewpoint and consider how different users might interact with and benefit from our design.

This experience was further strengthened by the fact that we were not focused solely on producing a final polished product, but rather on developing a functional prototype. This distinction encouraged continuous reflection on our work and how it aligned with our original design parameters. Instead of striving for perfection, we focused on learning through iteration. This approach helped me understand that design is not a linear process, but rather an ongoing cycle of testing, feedback, and improvement. By regularly reflecting on our decisions and outcomes, our team was able to refine our ideas and make more thoughtful, informed choices.

Another major component of the course that contributed to my learning was the opportunity to engage with guest speakers and professionals in the field. These interactions expanded my understanding of assistive technology and the wide range of career paths within it. One of the most important insights I gained from these speakers was the recognition that there is no “one-size-fits-all” solution when designing for accessibility. Each individual has unique needs, preferences, and challenges, which makes the design process both more complex and more meaningful. This reinforced the importance of flexibility and adaptability in our project work.

In addition to guest speakers, our interactions with community members and users were especially impactful. These conversations provided real-world context that could not be replicated through research alone. Hearing directly from individuals about their experiences, challenges, and needs made the project feel more purposeful and grounded. It also helped us identify gaps between what we initially thought users needed and what would actually be useful to them.

This insight paired especially well with our trip to the Magical Bridge playground, as my team got to go on our own time and really take in the diversity of the space and the large number of users. It was clear that you could make a space be inclusive without making disabilities be the focal point. Rather you can carefully construct a space that interconnects accessibility and fun.

If I were to go through this process again, there are several things I would do differently. First, I would prioritize earlier and more frequent user testing. While we did engage with users throughout the project, incorporating their feedback even earlier could have helped us refine our ideas more efficiently. I would also focus on better documenting our design decisions along the way, as this would make it easier to track our progress and reflect on how our ideas evolved over time.

Additionally, I would encourage our team to create more low-fidelity prototypes earlier in the process. This would allow us to explore multiple design directions without committing too many resources to a single idea. Rapid prototyping could help identify potential issues sooner and lead to a more refined final design.

Overall, the support from the teaching staff and the structure of the course were very helpful. Even the constant trust and support from the Magical Bridge foundation was reassuring through the process, as they trusted our ability to create something that would help improve their space.

For future students, I would emphasize the importance of embracing flexibility throughout the design process. It is easy to become attached to an initial idea, but meaningful design often requires letting go of assumptions and adapting based on feedback. Actively engaging with users and remaining open to their perspectives is essential for developing solutions that are both effective and impactful. I would also encourage students to take full advantage of the resources available to them, including guest speakers, instructors, and community partners. These interactions provide valuable insights that can significantly shape and improve the direction of a project.

In conclusion, this project was an impactful learning experience that strengthened my understanding of user-centered design and the role of reflection in engineering. Collaborating with community members and designing for accessibility pushed me to think beyond my own perspective and approach problems with greater empathy and intention. The emphasis on iteration, feedback, and real-world engagement made this project especially meaningful. The skills I developed particularly in collaboration, communication, and adaptive problem-solving will carry forward into my future academic and professional work, shaping how I approach design challenges moving forward.

[redacted]
ENGR 210
Individual Reflection

One of the most meaningful aspects of this course for me was the opportunity to work on a real design challenge for a community partner. Our team focused on redesigning the Kindness Corner for the Magical Bridge Foundation playground, working closely with chief design officer, [redacted] and founder [redacted] Magical Bridge designs inclusive playgrounds that intentionally bring together children of all abilities. Our project explored how the Kindness Corner could become a place that encourages interaction, curiosity, and empathy between children. The concept we developed was an open gear table that allows children to experiment with gears together, enabling parallel play and collaborative exploration without requiring a single defined outcome.

Reflecting on the process described in the *Learning through Structured Reflection* article, I realized that the most valuable parts of the project were not necessarily the technical aspects of building the prototype, but the interactions and observations that shaped our understanding of the design challenge. At the beginning of the project, our team spent time researching inclusive playground design, looking at prior artifacts / elements and learning about the philosophy behind Magical Bridge's "Design for All" approach. These early conversations helped frame the problem in a much broader way than simply designing a new playground element.

The most important part of this phase was our visit to the Magical Bridge Playground in Palo Alto with [redacted] where we noticed the lack of activity in the Kindness Corner. This helped us zero in on a real, human issue we saw at the playground and design for it. The goal was not just to create something fun, but to design an experience that could go into the Kindness Corner and that could support open-ended play, social interaction, and accessibility across a wide range of abilities.

Our interactions with [redacted] and [redacted] were especially influential. Hearing directly from people who had spent years designing and advocating for inclusive play spaces gave us valuable insight into how playground environments can shape social experiences. One idea that stood out to me was the importance of parallel play. Not every child approaches play in the same way, and some children may prefer to interact with an activity independently while still sharing the space with others. Designing something that allows children to participate at their own comfort level while still feeling included became a guiding principle for our concept.

These conversations strongly influenced the direction of our design. Instead of creating a highly structured activity with a clear goal or endpoint, we explored ways to design something more open-ended. This thinking eventually led us to the concept of the gear table. The table allows children to slide, place, and connect gears in different ways, watching how their motion translates across the system. Because the table is open, multiple children can engage with it simultaneously without needing to follow a specific sequence or compete for control. In this way, the design supports both independent experimentation and collaborative play.

The prototyping stage was also a valuable part of the process. As someone who works as a course assistant in a makerspace, I am very comfortable with fabrication and prototyping. Building the gear table prototype allowed our team to explore how the concept would actually function in practice. Physical prototyping revealed several considerations that were difficult to anticipate during the brainstorming phase, including spacing between gears, durability, and how easily children could manipulate the pieces. Seeing the concept take physical form also helped us communicate the idea more clearly to our partners.

However, reflecting on the entire process, I would say that the human-centered aspects of the project were the most valuable for me individually. Working with the Magical Bridge Foundation reinforced how thoughtful design can shape social environments and create opportunities for inclusion. The project reminded me that assistive or inclusive design is not only about solving functional challenges, but about designing spaces that support connection, dignity, and belonging.

If I were to go through this process again, I would likely spend even more time observing and interacting with the playground environment itself before developing concepts. While our research and discussions with [redacted] and [redacted] were extremely helpful, direct observation of how children interact with existing playground elements could have provided additional insights into patterns of play and movement beyond our initial visit. Early observational research might have helped us refine some design decisions earlier in the process and going back consistently for user testing would've proved extremely useful.

The course structure and teaching staff support were helpful in guiding us through the different stages of the design process. The opportunity to present ideas, receive feedback, and iterate midway through the quarter via the midterm reports and presentations helped our team stay focused while still allowing room for exploration / change. One of the strengths of the course was the emphasis on community engagement and real-world design contexts. Knowing that our work was connected to an actual playground and organization made the project feel meaningful and grounded.

For future students taking this course, my advice would be to fully embrace the conversations with community partners and users. Those interactions often provide insights that cannot be discovered through research alone. It is also important to remain open to changing direction as new information emerges. Some of the most meaningful ideas in design come from unexpected observations or discussions.

Overall, this project was valuable because it reinforced the importance of empathy, curiosity, and collaboration in the design process. As someone who hopes to become a product design engineer, I found it especially meaningful to work on a project that demonstrated how thoughtful design can bring people together. Designing the Kindness Corner gear table reminded me that engineering and design are not just about building functional systems, but about creating environments where people feel included and empowered to participate.

[redacted]
ENGR110
March 16, 2026
ENGR110 Individual Reflection

Throughout this course, my team and I worked with [redacted], a community member who has mobility challenges and a visual impairment. On the second day of class, we heard [redacted] propose her projects, one of which was an art easel, designed to allow her to paint with an easel that worked with her wheelchair. From the start, my group and I were very motivated by this project. For me personally, I have a grandmother who, although is not using a wheelchair yet, loves to paint and draw. Thus, I resonated very strongly with [redacted] and wanted to not only help her but also give insight into potentially helping my own grandmother.

Working through designing, testing, and fabricating our device, there were lots of useful and valuable steps that played a key role in ensuring our project's success. The first step that was essential to our group's work was understanding our problem. Of course, researching the problem and finding existing solutions online was helpful; however, what was most helpful was visiting [redacted]'s home and getting to interview her. Coming into this, we expected this interview to be short and simple, discussing her requirements for this device and getting some measurements for our design. However, we soon realized that these expectations were unrealistic. In this interview, we spent 3-4 hours understanding who [redacted] is, learning how disabilities affect her daily life, trying some of her assistive technology, and then finally getting her requirements and measurements. This process, although somewhat unexpected, proved to be very beneficial to our project. By understanding not only our project problem in depth but also our project user, I think this greatly benefited our overall motivation and understanding of the work we were doing.

Secondly, our project greatly benefited from our approach to rapid ideation and prototyping. I think initially, coming into the class, our group had the expectation of our process being relatively simple and straightforward. However, we soon realized the importance of "failing fast." Due to the nature of building a device that doesn't currently exist, there were lots of unknowns that surrounded our project. Questions would constantly arise that we wouldn't have the answer to. However, what my group and I learned was the importance and value of rapid prototyping and ideation. Through this process, we were able to get our ideas out of our brains and onto paper (through a sketch) or into real life (through a prototype). By doing this, our learning and understanding increased tremendously. Being able to visualize a problem or even test a prototype with [redacted] taught us so much that we would have never learned if we tried to make our product in one go. By continually testing our ideas and getting a better understanding of small or even larger issues that stood in the way of a successful prototype, we were able to make a fully functional prototype in the end that [redacted] could use.

Looking back, there were a few things that I would have done differently that potentially would have made our process smoother and our end product better. The first thing I would have done differently was to meet with [redacted] in person more. Throughout the quarter, we met with

[redacted] three times at her home, maintaining communication with her when not visiting through email. However, although most of the communication was done through email, I think our most productive learning was done in person. I think this is due to the fact that so much more information and thought processes can be communicated and clarified in person rather than sending emails back and forth. Although our group maintained proper communication via email, in-person meetings with her would have been more productive. Additionally, another thing I would have done differently is learning to put the user first more quickly in the quarter. Lots of times, my group members and I had ideas that we thought were great, but [redacted] did not like at all. This was covered in a few of the lectures we had; however, experiencing the importance of prioritizing user input firsthand was incredibly eye-opening and something that I wish I had known sooner in the quarter.

Overall, throughout this class, there was a great amount of learning and gratification that I experienced. Being able to use engineering to build something that helps someone in the community was a great experience that I am incredibly grateful for and proud to have participated in. I would strongly recommend this class to anyone who is interested in it and would gladly take it again.

Final Reflection - [redacted]

One of the most important aspects of our process was direct interaction with our user, [redacted]. One particularly eye-opening moment occurred when we visited her home and saw the artwork she creates. She is incredibly talented, and seeing her work firsthand put into perspective how a person's passions can sometimes be limited by accessibility barriers rather than ability. Designing an easel that integrates with her wheelchair has the potential to significantly improve her experience while creating art. After that visit, I felt I had a much deeper understanding of the practical challenges [redacted] faces as a wheelchair user. She even allowed us to try using her wheelchairs ourselves, which provided a valuable firsthand perspective. That experience helped us better step into the shoes of our user and ultimately gave our team a clearer understanding of the problem we were trying to solve.

Additionally, I think that the prototyping process was also very valuable. Wheelchairs have many complex interaction points, and our first round of prototyping exposed many issues about how we ideated those connections. Generally, in engineering, it is always important to prototype multiple times. Even after that first round, I found that we learned about the difficulties with dimensioning and interface between the easel and the wheelchair. After that, the pivot to create a functioning project was attainable and more understandable.

I thoroughly enjoyed the lectures and guest speakers in this class. I felt like the lectures were very thorough and Dave structured them well. The guest speakers were incredibly interesting - my favorite one was with Steve Cousins and Michelle Wang, working on the robots who follow people. It was really fascinating to see the amount of assistive technology out in the world and how it is evolving. I also thought that the design of the tableware for people with cognitive impairments (Sha Yao). As someone who has close relationships with people in my family with some of those physical struggles, it's really amazing to see the care that people put into the innovations that address those root issues for people with disabilities.

The team I worked with in this class was also really great. I enjoyed the energy we brought to our project, with meetings with our project suggestor and in class. I had known two of them before ([redacted] and [redacted]) but didn't know [redacted] yet. I think that working together towards a common goal always brings people together, and we really enjoyed getting to know [redacted] as well. The dynamic of our group was really fluid and I think we all supported each other throughout the quarter. For example, if someone had a project or commitment the week we were making a prototype or our final iteration, the rest of the group was very understanding with what needed to be done and how to support each other. I know that it was emphasized that sometimes work can be unevenly distributed or difficult to complete with a group of four, but I think that for the situations we were all in this quarter (being ME students), it was really nice to have that extra support through our group. The first meeting we had with [redacted] at her house was very bonding for all of us - through using the wheelchairs and talking with [redacted] about her daily life was really cool.

One thing I noticed that I was particularly aware of was not offending people when talking about disabilities. Sometimes it even felt wrong to use the words “disabilities” or “able-bodied people”. I understand that there can sometimes be triggers even surrounding the simple words that are used, so it was interesting to see how my awareness surrounding that grew through the quarter. With that being said, I think that being immersed very deeply into a community of people with disabilities has given me a deeper sense of what living with one may feel like or what challenges I would face daily if I were to be affected by one. It also gave me a heightened sense of gratitude for the simple things I can do every day.

My mom works with disabled children in elementary schools as an SN aide. I have always admired her heart and her care for these children. I was excited to be involved in a class where I could help people similar to her. Especially with engineering directly! Overall, I learned a lot from this class, and it truly was a pleasure to be involved with ENGR110!

ENGR 210 has been one of the most influential courses I have taken during my engineering education. Through this course, my teammates and I were able to design a novel obstacle and curb drop-off detection system for [redacted], a powered wheelchair user. Our current iteration of the device uses three infrared time-of-flight sensors mounted near the front of the wheelchair to detect nearby obstacles and curb drop-offs. The system alerts [redacted] through speakers when a hazard is detected and includes a control panel that allows [redacted] or [redacted] to turn the system on or off when needed. This project allowed me to engage deeply in the design process while developing a device that could meaningfully improve a wheelchair user's ability to navigate their environment safely and independently.

I first heard about ENGR 210 through [redacted] who described it as a hands-on course focused on assistive technology design. I decided to take the course because I wanted to work on a project that had a direct and tangible impact on a real person. Many of the engineering courses I have taken previously have focused primarily on theoretical problems or abstract design exercises, but ENGR 210 offered the opportunity to collaborate with a real user and address real challenges they face in their daily life. The idea of building a device that could improve someone's mobility and independence was a major motivation for enrolling in this course.

At the beginning of the term, I expected the course to involve designing and building a device for a specific user, but I underestimated how complex the process of defining the problem would be. In many traditional engineering projects, the specifications are clearly defined at the beginning. In contrast, [redacted]'s needs had to be understood through a combination of observation, discussion, and iteration. Our team had to learn how [redacted] navigated through his environment and identify where technology could meaningfully assist him. This experience challenged me to think beyond purely technical performance and consider usability, accessibility, and reliability. In this sense, the course exceeded my expectations because it pushed me to think more holistically about engineering design.

One of the biggest challenges during our design process was fully understanding what [redacted] wanted from the product and determining what the final system should look like. Unlike many of my previous projects where the primary stakeholders were other engineers, this project required us to design for someone who does not necessarily describe needs in terms of technical requirements. Translating [redacted]'s experiences into engineering specifications required careful listening and repeated feedback. Through this process, I learned that successful engineering design often begins with empathy and communication rather than purely technical analysis.

For our team, dividing responsibilities based on our strengths proved to be an effective strategy. [redacted] primarily handled the electronics and firmware development, while I focused on designing the mechanical enclosures and mounting systems for the sensors and other components. This division allowed each of us to contribute in areas where we were most comfortable and productive. However, not every aspect of our team dynamic was smooth. Two members of the team were initially responsible for preparing reports and presentations, but

they were not always present for meetings or progress sessions. As a result, I ended up completing a large portion of the work for the midterm report and presentation.

Despite this challenge, the experience ultimately became a valuable lesson in communication and teamwork. After raising concerns with the team, those members began taking greater responsibility for documentation and presentation tasks. This situation taught me that addressing issues directly and constructively is often necessary to maintain a healthy team dynamic. While it can feel uncomfortable to bring up concerns about workload or participation, open communication is essential for collaborative engineering projects.

One of the most rewarding aspects of the project was meeting with [redacted] and [redacted] staff on a weekly basis. These meetings allowed us to observe how [redacted] navigates his environment and understand the challenges he encounters when maneuvering through narrow pathways or approaching curb edges. Seeing these situations firsthand helped us better understand why certain design decisions were important. It also reinforced the idea that assistive technologies must be both reliable and intuitive. If the system produces false alerts or fails to detect hazards, it could reduce [redacted]'s trust in the device and ultimately limit its usefulness.

There were also moments during the project that made me feel somewhat uncomfortable, particularly when testing early prototypes that were not yet fully reliable. Knowing that [redacted] might eventually rely on this system for safety made me very aware of the ethical responsibility involved in designing assistive technology. This experience reinforced the importance of careful testing, thoughtful design decisions, and clear communication about the limitations of a prototype. Engineers must consider not only whether a system works, but also whether it is safe and trustworthy for the people who depend on it.

The easiest aspect of the project for me was working on the mechanical design of the system. I enjoy using CAD tools and thinking about how different components can be integrated into a functional system. Designing the enclosures and mounting structures allowed me to apply these skills while also considering practical factors such as durability, accessibility, and sensor placement. The most difficult aspect of the project was balancing technical design work with documentation, communication, and coordination among team members. However, this challenge helped me develop a greater appreciation for the collaborative nature of engineering work.

Overall, ENGR 210 has helped prepare me for my professional career by reinforcing the importance of human-centered design, teamwork, and ethical responsibility. Engineering solutions must account not only for technical feasibility but also for the real needs and experiences of the people who will use them. As someone interested in working in engineering fields related to product development and systems design, this course provided valuable experience in designing technology for real users and real constraints.

Perhaps the most important lesson I learned from this course is that empathy plays a critical role in engineering. Technical knowledge alone is not sufficient to create meaningful solutions. Engineers must understand the perspectives and challenges of the people they design for. By working closely with [redacted] and observing how he interacts with his environment, our team was able to develop a solution that is grounded in real needs rather than assumptions. This experience has fundamentally shaped how I approach design problems and will continue to influence my work as an engineer in the future.

[redacted]
Individual Reflection
ENGR 110

Many of the lessons, speakers and lectures in class were instrumental in helping me guide my exploration of disability and homelessness. A few specific lectures were especially useful. First, I loved the broad and inclusive definition of disability and assistive technology that the class presented, because it opened my mind to the fact that there is really no definition of “normal” or “full” ability, and many people require or would benefit from assistive technology in some regard. I had never thought about disability this way or considered assistive technology to be such a broad category. Another very big revelation this class brought about was in the understanding that “assistive technology” devices don’t necessarily only help people with disabilities, and often trying to design tools to be easy, comfortable and convenient to use simply makes a better product that anyone can benefit from. Some very interesting examples I learned in/out of this class during this quarter were that SMS texting was originally invented for deaf people, electric toothbrushes for people with limited mobility, and audiobooks for people with visual impairments. Because the final conclusions of my paper were that the definition of assistive technology can broadly be applied to housing for individuals with mental health, addiction or physical disabilities, this was the clearest connected course concept to my final product. However, I learned many other things from the course along the way.

Lectures from guests, particularly the lecture about creating an assistive eating utensil company and the one about wheelchairs production in developing countries both broadened my mind about non-conventional approaches to assistive technology. Conversations with the instructor, Mr. Jaffe, were particularly useful because this was the original touchpoint of someone much more familiar with the field of assistive technology, where I was able to fuse my own interests in unhoused policy with the broader topics of the class. Since much of my initial exploration was through exploring existing literature as I worked through logistical issues setting up community member interviews, I was able to brush up on research skills, read some very interesting articles about the general space, and come into the interview phase of my project feeling informed and prepared.

Ultimately, though, I found the interviews of community members the most useful for my final design. This is where I was able to interact with people directly experiencing and/or observing this set of problems, and their insights were invaluable. I also worked at an addiction shelter for 5+ years, so I was able to bolster my interview insights with personal anecdotes and experiences as well. One challenge I had with this portion was getting very busy individuals to respond and set up interviews with me within the time frame. I also had the incredible experience of being able to speak directly with people experiencing homelessness, which, while they were not comfortable with being recorded, was very eye opening and moving.

If I could go through this process again, or if I had to advise future students, I would advise them to reach out to a wider net of interview subjects first thing, prior to any literature review-type work, because my exploration would have been bolstered by having more interviews lined

up. I also would love to expand these findings for more specificity: what kind of housing has the most impact? How can we make it the most broadly accessible without overspending and making the entire prospect unreasonable? I quite enjoyed the project, though, and am glad to have had the opportunity to learn and explore so much through this class. Thank you for a great quarter!

[redacted]
ENGR 210 Individual Reflection

Throughout the course of the quarter, all aspects of the course have contributed to the journey towards my group's ([redacted]) device prototype. The guest lectures were helpful in providing examples in thoughtful design, needfinding, and even served as a source of inspiration. For instance, attending the assistive technology fair was motivating for me as I was able to hear firsthand accounts of how real needs were translated into technology that served others, and how keeping sight of the people the technology was meant to serve yielded successful designs and positive results. Hearing from the team behind the Lotus ring, and hearing about how the idea for the product came from a real need the founding team experienced, and how their design iterations were largely based on real feedback from case studies, demonstrated the importance of meeting thoughtful engineering with human-centered design. This lesson was something I tried to carry with my group and me as we developed our course prototype.

Conversations with our project suggestor, [redacted], and his brother, [redacted], helped us align ourselves with this value of human-centered design. At the beginning of the course, with just the project description available to us, we began ideating device prototypes that pleased us as a team of engineers. However, we quickly realized through our conversations with [redacted] and [redacted] that our idea for what a successful prototype would be did not meet the needs we sought to address, as well as the idea that would be informed by [redacted] and [redacted], those who had real insight into the problem we were trying to address.

For instance, we initially believed that using a tactile feedback system would be more impressive and effective from an engineering perspective, but after speaking to [redacted], he helped my team, and I realized that it would not serve him the best, which is what we had set out to do with the project. Finally, exchanges with Dave helped me meet the element of human-centered design with thoughtful engineering.

Early on, Dave served as a resource when he sat down with both groups working on the obstacle detector project to lend some advice based on his previous experiences with assistive technology that depends on ranging sensors. This helped us imagine solutions, and further conversations with Dave helped us solidify our engineering goals for the project.

If I were to go through this process again, I would hope to be more collaborative. Since the project was a mechatronics project, the primary goal of the group was to ensure that every component of the project complemented each other, from the electronics to the software and the physical casing. Although this yielded some success, I believe we could have been more efficient if we had leaned on each other for help in each component of the project. Towards the end of the project, as we got deeper into the technical aspects of each part of the project, we began to assist each other across domains, so doing so earlier on in the project would have helped us learn and contribute more. Additionally, conversations with the other groups, particularly the other obstacle detector group, yielded new insights during the project showcase at the end of the course. We exchanged ideas on sensing, audio systems, and more,

which were new to both of us, so doing so earlier would have opened up our perspective on the engineering of our project, which could have yielded a better prototype.

Finally, I would like to reflect on my initial goals and expectations for the course and how they were met by the end of the quarter. I came across the course while searching for engineering courses on the course enrollment website outside of the EE department, where I could apply some of the skills and knowledge I have accumulated throughout my engineering career. I was searching for a course that would allow me to explore the purpose behind engineering, specifically how it can benefit others, and to develop the soft skills necessary for purposeful engineering. By hearing from the instructor and guest lecturers on how they develop technology in collaboration with the people they aim to serve, while getting to practice this need-finding and human-centered design with [redacted], [redacted], and the rest of the [redacted] [redacted] team proved to be an invaluable experience that I could not have gained in any of the typical EE courses where a project is largely self-directed without any input from real people outside of the technical perspective.

Designing assistive technology has always been something I cared about, but this project made that interest feel real. Being able to create something for a group that is often overlooked was honestly one of the most meaningful parts of my experience this quarter. From the very beginning, when we were introduced to the potential project partners, it was clear to me that I wanted to work with the Magical Bridge Foundation. At first glance, playgrounds seem like something that has already been perfected. There are so many of them, and they all look functional. But through this project, I realized that most playgrounds are actually far from inclusive. While ADA requirements exist, many designs aim to meet the minimum rather than truly consider the full range of users. Magical Bridge stood out because they go beyond compliance and instead design for everyone, regardless of age or ability.

One of the most valuable parts of the process was visiting the playground and observing how people actually interacted with the space. On paper, the Kindness Corner was intended to be a meaningful and reflective area, but in reality, it was underused. Most activity was centered around the slide mound and spinning features, while the Kindness Corner was mainly used for seating rather than play. Seeing this in person shifted our entire perspective. It reinforced that design decisions cannot be made in isolation. What looks good conceptually does not always translate to real engagement. That visit was probably the single most impactful moment of the project because it grounded everything we did moving forward in actual user behavior.

Our interactions with the Magical Bridge team, especially [redacted] and [redacted] were also extremely valuable. They emphasized the importance of designing for neurodivergent users and creating spaces that are calming, inclusive, and open-ended. That conversation really changed how I thought about design. Instead of asking “does this work?” we started asking “who does this work for, and how does it make them feel?” That shift pushed us away from building something that simply functions and toward building something that creates an experience. It also led us to prioritize qualities like quiet interaction, smooth motion, and the absence of a “correct” outcome.

The ideation process itself was another important learning experience. We explored multiple concepts, including the Friendship Maze and Build-a-Scene, before ultimately choosing the Gear Table. What I learned here is the importance of divergence before convergence. Early on, it felt inefficient to explore ideas that we might not use, but looking back, those alternatives helped clarify what actually mattered. The Gear Table stood out because it met all of our design criteria: it allowed for parallel play, had no defined end goal, and encouraged interaction through motion. More importantly, it created a shared experience where multiple users could engage at the same time without pressure.

Prototyping and testing were also incredibly valuable parts of the process. Our first prototype revealed issues we did not anticipate, such as gears slipping out of plane and a lack of stability. These failures were frustrating at the moment, but they ended up being some of the most important learning opportunities. Each iteration forced us to think more critically about constraints, safety, and usability. By the final prototype, we had enclosed the gears, improved stability, and introduced multiple interaction points, which made the design both safer and

more engaging. This iterative process taught me that good design is rarely achieved in one attempt. It is built through testing, failure, and refinement.

User feedback further reinforced this idea. Hearing comments like how engaging the device was, but also noticing small issues such as gear shifting, helped us understand that even small details can significantly impact user experience. It showed me that design is not just about creating something functional, but about continuously improving based on real feedback. If I were to go through this process again, I would prioritize earlier and more frequent user testing. While we did incorporate feedback, I think bringing users into the process sooner could have helped us identify key issues earlier and refine our design more efficiently. I also would have pushed for more structured documentation during prototyping, especially when tracking what worked and what didn't across iterations. In terms of support, the teaching staff and course structure were helpful in guiding us through the design process, especially during the ideation and prototyping phases.

For future students, my biggest advice would be to truly center the user in every decision. It is easy to get caught up in making something technically impressive, but that does not always translate to meaningful impact. The most successful parts of our project came from moments where we stepped back and asked whether our design actually served the people we were building for. I would also encourage future teams to embrace iteration and not be discouraged by early failures, because those moments often lead to the strongest improvements.

Overall, this project changed how I think about engineering design. It reinforced that the goal is not just to build something that works, but to build something that matters. Designing for inclusivity requires more than meeting requirements. It requires empathy, observation, and a willingness to continuously adapt. This experience showed me that when those elements come together, engineering has the power to create spaces that truly bring people together.

[redacted]
ENGR 110: Perspectives in Assistive Technology
Professor David L. Jaffe
March 17, 2026

Individual Reflection on Design Process and Learning

I initially decided to take this course because I was interested in the intersection of engineering, design, and real-world impact. As a student-athlete, my schedule is often structured around performance and measurable outcomes, so I was drawn to a class that emphasized human-centered design and working directly with communities. At the beginning of the quarter, I expected the course to focus primarily on building a functional prototype. However, what stood out most by the end was not just the final product, but the process - especially the emphasis on observation, iteration, and reflection.

The concept of structured reflection played a significant role in shaping my experience throughout the project. As described in the reading, reflection is not simply about expressing opinions or feelings, but about analyzing experiences through multiple lenses and connecting them to broader systems, ideas, and assumptions. This approach pushed me to think beyond surface-level observations. For example, instead of simply noticing that the Kindness Corner at the playground was underused, our team had to ask why it was underused and what that revealed about social interaction, accessibility, and design. Reflection allowed us to connect our observations to larger themes such as inclusion, sensory processing, and the social barriers that children with disabilities may face.

Throughout the quarter, we engaged in several stages of the design process, including research, user observation, brainstorming, prototyping, and testing. Each stage contributed differently to our final design. Background research helped us understand the needs of children with autism and sensory sensitivities, but it was not until we visited the playground and observed real users that the problem became tangible. Seeing how children interacted - or didn't interact - with certain spaces made the design challenge feel real and urgent. This aligns with the idea from the structured reflection article that experiences become more meaningful when they are examined in connection with real-world contexts.

Brainstorming and concept development were also valuable, but in a different way. This stage encouraged creativity and pushed our team to explore a wide range of ideas, from an accessible maze to a sensory light path. However, not all ideas were equally feasible. The Inclusion - Innovation Matrix helped us evaluate our concepts more critically, balancing creativity with practicality. This was an important learning moment for me because it showed that good design is not just about coming up with creative ideas, but about making thoughtful tradeoffs.

Prototyping was one of the most impactful parts of the process. Building a physical model forced us to translate abstract ideas into something tangible, which revealed challenges we had not considered before. For example, designing rotating conversation prompts seemed simple in

theory, but required careful thinking about usability, durability, and accessibility. Testing the prototype with users was especially valuable because it provided immediate feedback. Seeing participants naturally engage with the prompts without instructions reinforced that intuitive design is critical.

Interactions with professionals and community members were some of the most meaningful aspects of the course. Working with [redacted] and [redacted] gave our project a level of authenticity and purpose that would not have been possible otherwise. Their feedback helped us refine our ideas and ensured that our design aligned with real community needs. In particular, learning that the Kindness Corner was underused directly shaped our decision to focus on making that space more interactive. This interaction was especially rewarding because it showed that our work had the potential to contribute to an actual project, not just a classroom assignment.

Guest speakers and class discussions also broadened my perspective on accessibility and design. They highlighted that inclusive design is not just about meeting minimum requirements, but about creating environments where people of all abilities feel welcomed and engaged. These interactions reinforced the importance of empathy in engineering and challenged me to think about design in a more holistic way.

If I were to go through this process again, I would spend more time on early-stage user testing and iteration. While our prototype was effective in demonstrating the core concept, there were limitations in scale and functionality that could have been addressed with more time. I would also prioritize gathering feedback from a more diverse group of users, including children with different abilities, to better understand a wider range of needs. In addition, I would explore more detailed material testing earlier in the process, particularly for durability and outdoor use.

In terms of team dynamics, our group worked well together overall. One of the strengths of our team was our ability to divide tasks efficiently while still collaborating on key decisions. However, one challenge was balancing different ideas and perspectives during the brainstorming phase. At times, it was difficult to decide which direction to pursue, but this ultimately led to stronger decision-making because we were forced to justify our choices. This experience taught me the importance of communication and being open to feedback, even when it challenges your initial ideas.

This course also made me reflect on how engineering solutions can have broader social and ethical implications. Designing for inclusivity requires considering not only functionality, but also dignity, accessibility, and equity. One subtle challenge we faced was ensuring that our design did not feel stigmatizing or “different,” but instead encouraged interaction among all users. This reinforced the idea that good design should be inclusive by default, rather than creating separate experiences.

Personally, this course helped me develop skills that I know will be valuable in my future career. It strengthened my ability to think critically about design problems, work collaboratively in a

team, and communicate ideas clearly. More importantly, it shifted my perspective on what it means to be an engineer. Rather than focusing solely on technical performance, I now see engineering as a way to create meaningful experiences and improve people's lives.

Overall, this course exceeded my expectations. What started as a design project became a much deeper learning experience centered on empathy, reflection, and real-world impact. The combination of hands-on work, community engagement, and structured reflection made the learning process more meaningful and memorable. This experience has influenced how I approach problem-solving and reinforced my interest in designing solutions that are not only functional, but also inclusive and socially impactful.

I decided to take this course because I met Dave at an IDD Brunch, and he told me about the class. I am majoring in bioengineering, but I want to become a physician who works with individuals with intellectual and developmental disabilities. I felt this class could help me learn a bit more about engineering and assistive technology. Many of my family members and myself use assistive technology. I was especially interested in the theme of the course being almost anything is assistive technology such as the plumbing in our dorms. I was also interested in how what I perceived to be the definition of disability was expanded.

I found my interactions with the instructor of the course particularly helpful when thinking of next steps for my project. It was particularly helpful to hear the possibilities other people saw in my project as my point of view was limited to what I was working on. It was fun to think about different applications of fidget jewelry such as “build-your-own” kits.

Interacting with my project suggestor was extremely helpful as I already had a personal connection to this individual. It was a bonding experience where we both contributed to a project we felt was meaningful.

If I were to repeat this project again, I would have spent less time making Pugh Charts in interviews and more time making prototypes. Once I started making prototypes, I realized that was the meat of the project and the Pugh charts were more of a side.

I felt guest lecturers were fun and interesting, but their work was far more technical whereas mine was much more artistic. I would have liked to hear from guest lecturers who make artistic assistive technology. For example, my sister used corrective braces on her feet when she was younger that had a variety of art on them such as flowers and rainbows. I would love to hear from the professionals who make assistive technology for children and adults in fun and creative ways.

My project suggestor is a family member who lives in a different state and their reaction to the project was excitement to be involved in my classes. If I could have had my project suggestor try the product out this quarter, I feel this would have improved my final product. My expectation was our Zoom meetings would include a lot of feedback based on the appearance of the jewelry because they could only see and not touch it. I had to rely on many of my own opinions throughout the quarter. I felt I learned a lot by pretending to be in their shoes when creating and testing out the products.

Making the jewelry came natural to me as I have made jewelry for several years. However, thinking about how to engineer each piece did not come naturally to me. I have not taken many engineering courses, so I chose to complete the course for 1 unit. I found having this option to be particularly helpful.

My favorite class of the quarter was the Magical Bridge Playground trip and the visit to Ada’s Cafe. I am part of the Stanford Down Syndrome Research Center and have heard about how

Ada’s Cafe is delicious. This was proven true! It was amazing to hear the mission behind the playground and see the tactile map that had a sound description that tracks the hand.

I would appreciate it if the course considered assistive technology for individuals with intellectual disabilities. Many of the guest lecturers and projects focused on physical disabilities which I think can have more obvious assistive technology applications, but I think there is a ton of value and creativity in creating products for individuals with intellectual and developmental disabilities. For example, people with neurodivergence often use bulky noise cancelling headphones in busy public spaces. I think these headphones could be improved in appearance and function.

The course helped me think about what assistive technology I use every day in my life and how it may be improved. I regularly use a backpack which I now realize is assistive technology that helps me carry my belongings more easily. I wonder how I could adapt my backpack to sit on my carry-on more easily when I travel. This course has opened my eyes to assistive technology everywhere.

I would have enjoyed working in collaboration with other people in the class working on individual projects. I think having 10 minutes at the end of every class to talk with other groups to share advice and ideas could improve the class experience. I would also have enjoyed more activity-based interactions with the guests in addition to lecture. I remember one lecture we were talking about Stanford's accessibility features on devices and we played a game on our laptops. I enjoyed the activity and think encouraging lecturers to prepare a small activity could increase the energy of the classroom.

This was an amazing class and I am very thankful for all the cookies and knowledge I gained.

[redacted] [redacted]
Perspectives in Assistive Technology
2026-03-16
Individual reflection

Perspectives in Assistive Technology is the best class at Stanford. The project was enjoyable and meaningful, and the lectures were fascinating and given by incredible people. Dave's experience teaching this class (for 20 years now!) made it run smoothly with very clear expectations for what students needed to do. Tori and Dave put a lot of effort into providing detailed feedback that showed they cared about each team and had high standards for us.

The guest lecturers were all leaders in their fields. Learning from all of them was a unique experience only possible because of the connections that Dave has built across the field of assistive technology. Peter and Ralf particularly stood out since they ride wheelchairs and have both had amazing adventures while also founding organizations to improve accessibility. It was extra special that I got to have dinner with both of them after their lectures. Ralf started many shops that build inexpensive wheelchairs using bicycle parts and a design he developed. Now these shops seem to be running relatively independently. Peter is working from almost the opposite direction by creating tests and standards. He said that a single standard that he creates can have a very widespread impact. As an ME218 student and CA, I was honored to meet Peter since he was in the first 218 class.

Working on the project was extremely fun. I'm happy that there was a project this year that involved mechatronics engineering. My team's project, [redacted], responds to a need for a device that helps wheelchair users with vision impairments avoid driving into or off of curbs. We decided to use arrays of distance sensors to measure the ground surrounding the chair. I enjoyed designing circuits and software and practicing CAD. I wrote the software for [redacted] designed and soldered the electronics, made the 3D models for the front sensor enclosure and the central electronics box, helped CAD the control panel enclosure, and assembled the electronics inside every enclosure. I spent at least 25 hours per week on this class, but it was easy to stay motivated since it was a real-world project that a real person had asked for.

The technical work was fun, but the best part of the project was [redacted], the project suggestor, and [redacted], his brother. They were truly the best people to work for and I'm so happy to now be able to call them my friends. I really enjoyed meeting with them every week to discuss ideas, take measurements, test prototypes, ask [redacted] to chase me along sidewalks, and design our device together. I now feel even more strongly that engineers should spend time learning directly from and collaborating with the people they are engineering for. Working with a project suggestor to build mechatronic assistive technology is my dream job, and I absolutely loved getting a chance to do that kind of work in this class.

At the end of the quarter, we didn't have a device that could reliably warn about curbs. [redacted] gives false warnings, which are annoying and destroy trust in the device. I want to continue working on the device since I made a commitment to [redacted]. I'm disappointed that

we couldn't complete the project, but I'm really happy that Dave is able to offer independent studies to students who want to continue their projects. I would encourage anyone to take that offer if a project feels incomplete at the end of a quarter. If I could go through the process again, I don't think I would change much. We could have spent more time on the software and possibly written a more reliable sensing algorithm, but then there wouldn't have been time to make the electronics as reliable or the enclosures as complete. [redacted] advised me to focus on the sensing algorithm first since it is most important for proving that [redacted] has the correct sensors to even be a viable device, and maybe I should have listened to that. However, I feel [redacted] is at a great point for the start of an independent study.

As a note to future students, team formation is challenging if you don't already know two other people in the class, since there is a short timeline. Many teams turned into teams of four because it's hard to turn anyone down, even though a larger team makes scheduling more challenging. I would recommend looking for teammates who are interested in all of the different tasks required by the project. In my experience, trying to divide the project into researching, engineering, and documentation doesn't work well since, for example, it's hard to contribute to documentation for a system that you didn't build. It's also challenging when there are differences in how much time each team member has available for the class. Besides being advised to "work as a team," there wasn't much discussion about how to manage and organize work within a team. Our team faced challenges since no one was interested in being a project manager. I hope that in the future this class can be advertised more to mechatronics students. My teammate [redacted] had taken ME218 with me last year, and he was such a pleasure to work with in this class. He iterated mechanisms quickly, built his subsystems on schedule, and asked excellent questions during interviews. ME218 students often feel that the 218 projects are meaningless (they are meaningless, aside from being educational). Perspectives in Assistive Technology could be a great opportunity for ME218 students to continue building "smart products," but for an actual person and a real reason.

Individual Reflection - [redacted]

The biggest takeaway from this project was gaining a concrete understanding of the design process. This was the first project I worked on that was so clearly structured around the stages of design thinking. We moved deliberately through problem selection, extensive empathizing, iterative prototyping, and stakeholder testing, which made the process feel both rigorous and intentional. Rather than jumping straight to a solution, we were forced to sit with the problem, refine it, and continuously revisit our assumptions.

Of all these stages, prototyping was by far the most important and time-consuming, but also the most rewarding. It was in prototyping that many of our initial ideas began to break down in productive ways. Designs that seemed intuitive or well-reasoned on paper revealed flaws once we attempted to build them. For example, early on we focused too heavily on the angle between the floor and the heel, without adequately considering the relationship between the ankle and the pylon. This oversight significantly affected how the prosthetic would function in practice, and it was only through building and testing that we were able to recognize and correct it.

Our prototyping process itself evolved over time. We began with very rough models using wooden dowels, cardboard, and tape - materials that allowed us to quickly test basic concepts. From there, we transitioned to more refined iterations using 3D-printed parts, experimenting with materials like PLA and resin. Eventually, we began working directly with the real prosthetic components, designing around the constraints and realities of the existing system. Each stage of prototyping not only improved our design but also deepened our understanding of material limitations and trade-offs. For instance, we learned that while PLA is easy to print and iterate with, it may not provide the durability required for certain applications, whereas resin offers precision but introduces its own challenges (like the printer being occupied for weeks on end!). These hands-on lessons were difficult to anticipate beforehand and became some of the most valuable insights from the project.

At the same time, this project highlighted several areas where I would approach things differently in the future. One major change would be in how I scope and select projects at the outset. While prosthetics initially seemed like a compelling and meaningful problem space - and it certainly was - I did not fully understand the complexity of the challenge when we committed to it. After seeing the work of other teams, I realized there were alternative problems that I might have been equally, if not more, interested in exploring. In future projects, I would spend more time evaluating the scope, constraints, and day-to-day realities of a problem before committing, ensuring a better alignment between my interests and the work involved.

Another key area for improvement was our team dynamic. While everyone contributed meaningfully, we often worked in parallel rather than collaboratively. This meant that we were not always fully aligned on decisions, and integration between different parts of the project sometimes felt fragmented. In hindsight, more frequent check-ins and a stronger emphasis on shared ownership of the design could have improved both our efficiency and the coherence of

our final product. Design is inherently collaborative, and while dividing work can be efficient, it should not come at the cost of alignment.

Finally, I think the project would have benefited from closer engagement with a direct user. Although [redacted] was an incredibly helpful and knowledgeable resource, his perspective was shaped by his background in academia and as an inventor. While this brought valuable expertise, it may also have introduced certain biases in how the problem and potential solutions were framed. Having consistent access to an end user - someone who interacts with prosthetics in their daily life - would have provided a more grounded perspective and helped ensure that our design decisions were truly centered on user needs.

Overall, this project was an extremely valuable learning experience. It not only gave me a structured understanding of the design process but also emphasized the importance of iteration, material awareness, team alignment, and user-centered thinking. Perhaps most importantly, it showed me that good design is not about getting things right the first time, but about building, testing, and refining until the right solution emerges.

ENGR-110 Individual Reflection

Throughout the quarter, I developed a much deeper understanding of what it means to design for real people. Every component of this class contributed to that goal - from the guest speakers, to our project mentors, to the project itself. I can say with confidence that taking ENGR-110 as my first project-based engineering course at Stanford was a great decision, as it strengthened both my technical abilities and my teamwork skills. For clarity and organization, I've divided my reflection into three main categories.

Speakers & Lectures

I truly believe that the panel of guest speakers and lecturers in this course was exceptional. I appreciated how their relationships to disability, engineering, and assistive technology varied widely - from users, to makers, to researchers. The lectures that stood out most to me were those focused on human-interface technologies and the real-world practicality of assistive devices. In particular, the talks by Deborah Kenney and Gary Berke had a lasting impact on how I view the purpose of engineering in this space. Although they approached the topic from different perspectives - occupational therapy and prosthetics - their core message was the same: assistive technology is only valuable if people are willing to use it.

In contrast, some lectures - especially those focused on assistive robotics - left me feeling that much of the technology presented was not yet at a stage where most people would realistically adopt it, regardless of cost. This realization fundamentally shifted my perspective on engineering. Before this class, many of my ideas centered on what seemed "cool" or "impactful" on paper (such as therapeutic exoskeletons), without much consideration for usability or real-world constraints. I was more focused on whether something could be built than whether it should be. After hearing from our guest lecturers, I now prioritize utility above all else. If I am going to build something, I want it to serve a real person - not an abstract, idealized user.

Working with [redacted]

Of all my experiences in ENGR-110, working with [redacted] was by far the most impactful. Our conversations not only provided valuable technical insight into prosthetics, but also reinforced my values and motivations as an engineer. The most important lesson I took away from him is that designing assistive technology begins with understanding what the user truly needs and wants.

It is easy to make assumptions when designing for disabled users. For example, non-disabled designers may assume that users want to appear "normal," and therefore would prefer highly realistic prosthetics despite potential drawbacks. However, [redacted] emphasized that this is often not the case. Prosthetic users have diverse preferences: some value lifelike appearance, while many prefer simpler, more functional designs. Others may choose not to use prosthetics at all, instead relying on alternative assistive tools.

This perspective strongly influenced both my approach to our project and my broader career goals. During the [redacted] design process, I consistently encouraged my team to prioritize practical utility over designs that appeared more technically impressive. More broadly, I've become interested in pursuing a field that allows me to address individual, real-world needs. After speaking with [redacted] about his work, I began to see prosthetics as a compelling and fulfilling career path - one that combines engineering, physiology, and clinical care, while remaining deeply centered on the individual.

[redacted]

The project component of this course left me feeling the most conflicted. On one hand, it was highly engaging and intellectually stimulating. Designing a [redacted] that addresses ease of removal and enables smooth transitions between barefoot and shoe-wearing gaits is both a challenging and meaningful problem. I genuinely enjoyed the ideation, design, and prototyping process, and found great satisfaction in iterating on ideas.

On the other hand, collaboration within my team presented significant challenges. Conflicting schedules created logistical barriers, and our design philosophies often diverged. While I aligned with [redacted]'s belief that "less is more" and emphasized usability, my teammates tended to focus on what would appear most impressive in a final presentation. These differences, combined with inconsistent communication, led to misunderstandings about project direction and resulted in a significant amount of last-minute work.

That said, these challenges were valuable learning experiences. I now have a clearer understanding of how I want to approach team projects in the future. In this course, I took a relatively passive role - partly because I was the youngest member and was working with two long-time friends. However, I've seen how passivity can contribute to team dysfunction. Moving forward, I am motivated to take a more proactive role in coordinating schedules, facilitating communication, and ensuring alignment within the team. I also recognize the importance of establishing shared design values early in the process. Doing so could have helped us avoid many of the conflicts we encountered. Although these challenges limited the development of our prototype, I am grateful for the lessons they provided.

Conclusion

If given the opportunity, I would absolutely take ENGR-110 again. The course not only strengthened my technical and collaborative skills, but also reshaped how I think about engineering as a discipline grounded in real human needs. If I were to approach the experience again, I would invest more time and energy into the project from the outset and take a more active leadership role within my team. Moving forward, I plan to continue developing my project independently, using what I've learned to refine it into a more polished and practical solution. Ultimately, this course has had a lasting impact on how I approach design, and it has

motivated me to pursue engineering work that is both thoughtful and genuinely useful to the people it serves.

Individual Reflection – ENGR110/210: Perspectives in Assistive Technology

How I Found This Course and Why I Enrolled

I first came across ENGR110 when browsing the approved Concentration Electives for the Product Realization track in Mechanical Engineering. But what turned a passing interest into a genuine commitment was a conversation with my ME170 instructor, Jeff Woods. After I told him how meaningful it had been to work on assistive technology for my capstone project, he recommended ENGR110 as a natural next step for continuing that kind of socially impactful engineering work. His endorsement carried weight, because he had seen what that project meant to me, and he understood why I was looking for more.

The capstone project he was referring to was my work with Kyaro Assistive Tech in ME170, where I helped develop an off-road ergonomic wheelchair attachment. I traveled to Tanzania and worked directly with wheelchair users who had a wide range of needs and lived in environments that most wheelchair designs simply do not account for. That experience was the most purposeful engineering work I had done at Stanford. It gave the technical problem a human face and made the stakes of design decisions feel real in a way that classroom exercises rarely do. I returned from Tanzania wanting to continue working at that intersection of engineering and human need.

Since then, I had been actively looking for ways to keep building in this space. In CS225A, my experimental robotics class, I worked on a robotic system designed to assist elderly patients who are unable to wash themselves independently, again a project where the point of the engineering was restoring autonomy and dignity to real people. ENGR110 appealed to me precisely because of its emphasis on learning directly from users, engaging with communities, and developing solutions through iterative, hands-on design. It felt like the logical continuation of a thread I had been following since Tanzania.

Reflecting on the Design Process

This quarter's project challenged me to think about design in ways that go well beyond engineering constraints. Working on the [redacted] for the Magical Bridge Playground was a genuinely formative experience, one that reinforced how meaningful the interplay between user research, community partnership, and iterative prototyping can be. Looking back across the full arc of the project, from the initial literature review to building and testing a laser-cut acrylic prototype, I am struck by how each phase contributed something irreplaceable to the final outcome.

The background research phase grounded the team's understanding of the population we were designing for. Learning that approximately 90% of disabilities are non-physical, encompassing autism spectrum disorder, sensory processing differences, and cognitive disabilities, reoriented my mental model of what "accessibility" actually requires. Before this course, I had thought of

accessibility primarily in terms of ramps and wheelchair clearances. The research made clear that sensory overwhelm, unpredictability, and social anxiety can be equally significant barriers to participation. This shifted the entire framing of what a successful design would look like: not just something a wheelchair user could reach, but something that felt safe, predictable, and inviting for a child with autism who might be overwhelmed by a noisy, crowded playground.

The site visit to the Palo Alto Magical Bridge Playground was the most grounding moment of the entire process. Reading about inclusive design is one thing; standing in a space designed around it is entirely different. Observing how children actually moved through the playground which areas drew sustained engagement and which were bypassed gave the team concrete, human evidence that the Kindness Corner, despite being visually vibrant, lacked the interactivity needed to sustain interest. No amount of background reading would have revealed that insight as clearly as simply watching visitors for an afternoon. This observation directly shaped our design opportunity and ultimately led to the selection of the Conversation Wall over the other two concepts we developed.

The Value of Community Partnership

Of all the interactions that shaped this project, my conversation with Magical Bridge founder [redacted] stands out as the most pivotal. Her feedback was not generic encouragement. It was specific, honest, and actionable. She told us directly that the Kindness Corner was underutilized compared to the rest of the playground and that she needed a feature that would increase engagement and better reflect the foundation's mission. That clarity was invaluable. It eliminated ambiguity from our design brief and gave the team a concrete problem to solve rather than a vague aspiration to pursue.

What was equally instructive was the process of presenting our three design alternatives to a real stakeholder. The Inclusion-Innovation Matrix was a useful internal tool, but [redacted]'s immediate dismissal of the Water Play concept, despite its scoring, was a reminder that decision-making frameworks are aids to thinking, not substitutes for it. She understood the operational and safety constraints of her specific site in ways our matrix could not capture. Designing for a real community partner, rather than an abstract user profile, adds a layer of accountability and nuance that I found both challenging and motivating.

Prototyping and What I Would Do Differently

The prototyping phase reinforced something I had understood abstractly but now feel concretely: building something reveals problems that thinking about it never will. Our first iteration of the conversation prompt mechanism made it clear that prompt visibility and ease of rotation needed more attention than the digital renderings had suggested. The laser-cut acrylic prototype, while small-scale, allowed us to test the actual tactile experience of spinning a tile and reading a prompt and that feedback led to direct refinements in how the tiles were spaced and sized.

If I were to go through this process again, I would invest more time in user testing with actual children, ideally including children with autism or sensory sensitivities, rather than relying primarily on informal testing among team members and peers. The users we are designing for have specific needs that are genuinely difficult to anticipate without direct observation. I would also push the team to begin prototyping earlier in the process, even at a very rough stage, so that physical interaction with the design could inform the conceptual development rather than only validating it at the end. The iterative loop between sketching, building, and observing should be tighter than it was.

In terms of course support, the guest lecturers were consistently one of the most valuable elements of the class. Hearing from professionals who have spent careers navigating the intersection of engineering and disability, and who spoke honestly about the failures and unexpected insights along the way, made the design challenges feel real rather than academic. The lecture on wheelchair fabrication in developing countries, for instance, was unexpectedly resonant: the idea that grassroots inventors with limited resources were outpacing well-funded labs in terms of practical, durable design challenged my assumptions about where good engineering comes from. That perspective carried over into how I thought about the Conversation Wall: the most effective design is not necessarily the most technically complex one.

Advice for Future Students

For students who take this course in the future, my strongest advice is to take the community interactions seriously from the very beginning. It is easy to treat the site visit or the stakeholder meeting as a box to check before getting to the "real" work of designing and building. In my experience, the opposite is true: those interactions are the real work. The design insights that came from watching children at the playground and from [redacted]'s feedback were more generative than any brainstorming session we had as a team. Show up curious, ask open-ended questions, and be willing to have your assumptions overturned.

I would also encourage future students to embrace the discomfort of designing for users whose experience of the world is meaningfully different from their own. It requires genuine humility to acknowledge that you do not fully understand what a child with sensory processing differences needs from a playground and that humility is not a limitation but a starting point. The structured reflection approach described by Colby and colleagues is useful here: stepping back from immediate experience to examine it through a different lens is not just an academic exercise. It is a practical tool for becoming a more thoughtful engineer and a more empathetic collaborator.

Overall, this course gave me a framework for thinking about design that I expect to carry forward well beyond the quarter. The Conversation Wall is not a finished product. There are real engineering challenges still to be addressed, from weatherproofing electronics to full-scale accessibility testing. But the process of arriving at this concept, shaped by research,

observation, community partnership, and iterative building, felt like genuine engineering work in the fullest sense of the phrase.

[redacted]
ENGR 110
Professor Jaffe
15 March 2026

[redacted]

Reflecting on the [redacted] by the [redacted], one of the most important lessons I learned was that strong design is the result of an ability to rethink things. When the quarter began, I thought the design process would be relatively simple, make a sensor for [redacted] that could tell him when there's an obstacle in front of him. I was obviously wrong. In reality, the design was almost always evolving alongside the problem, and so was our understanding of the problem. In the beginning of the project, a significant portion of the work we focused on was understanding [redacted] l's specific needs so that we could research which systems already existed. From the discussions with [redacted] and [redacted], I came to understand that the problem wasn't just about general obstacle detection. It was about facilitating [redacted] 's ability to detect curb drop-offs, obstacles, and low-light hazards in a way that was easy and natural to incorporate into his daily life and did not make his wheelchair feel bulky, clinical, or harder to use. He was very particular about the way it looked and where it had to be placed, so it made our job a bit trickier. The initial interviews significantly influenced our design criteria, particularly with regards to stopping distance, wheelchair-compatibility, aesthetics, and ensuring the system didn't obstruct his existing ways of interacting with the world.

Our exploration phase was beneficial because it provided us with a technical foundation. However, it also taught me that research alone doesn't give you the answers. We investigated previous attempts such as LUCI, Strutt, previous wheelchair edge detecting systems, and several sensor technologies including ultrasonic, infrared time-of-flight, and radar. This research taught us what had been done before, where other systems failed, and what trade-offs we needed to consider. It also helped us determine that our aim should be an alerting system, rather than a system that would take over control of the chair. That was important, as it kept the project aimed at something safer and more feasible for our team to construct. Simultaneously, our own experimentation quickly told us that some ideas which seemed good in theory were not going to meet [redacted]'s needs. Ultrasonic sensing, for instance, seemed like it could be an option in the beginning, but when we tested it, it wasn't able to give us pre-emptive warnings. It was one of the earliest instances where I was able to appreciate the difference between researching a theoretical idea and determining, proving, or demonstrating if that idea actually works or makes sense in a real-world setting, which is something that was talked about quite a bit throughout the past 10 weeks.

Across all the interactions I had during this course, the ones that shaped my design thinking the most were the ones I had with [redacted] and [redacted]. The weekly Monday meetings with them allowed me to get into the nitty gritty of the system configuration and gave me the chance to talk about the level of comfort, visibility, dimensions, and spatial arrangement of the device. These questions gave me the details necessary outside "can it sense and alert [redacted]

in case of an obstacle?" Getting direct commentary from [redacted] in real-time was the reason we were able to make such progression in such short time. For example, [redacted] really was not a fan with the position of the front sensor we had determined to use based on our original design, but then we were able to redesign it quickly and let him try a new design.

I also think the advice Dave gave us was invaluable because it helped me learn to structure my ideas and work on answering the most important questions instead of just going through the motions. He was very influential in leading us in the right direction and he was a valuable mentor to our team. Some advice I have for future students is that the design process won't be smooth. As a non-ME major and someone who hasn't built much especially in this field, it's a bit of a shock to a system to get so much feedback and then have to make actionable changes. I would say you need to be willing to get your feet wet a bit because there's no right answers to the problem you're solving, and it DEFINITELY will take a few tries to get it right. It was definitely humbling working with such a technical and experienced team, but it only made my job that much more rewarding. Creating something that can impact someone's life is pretty special so being willing to pivot the design is a necessity in the success.

My biggest takeaway from this is that every time we came up with a new design that had physical components and had to make new decisions, it created a new set of issues. The most valuable thing from that shift was understanding how user input impacted our design. A good example was the front sensor mount. Earlier in the project, we considered several placement options, including a mount in front of [redacted]'s legs, since that offered the best field of view for him. From a technical perspective, it made sense. However, when [redacted] saw that design and tested it, he told us he would be uncomfortable going out in public with the sensor placed there, and he thought that the mechanism was too big. [redacted]'s feedback challenged our previous reasoning the most. That example represents the most valuable lesson I took from the class, which is that good assistive technology can't work in theory only. It has to work for the individual, and that includes their real-life context, where their comfort, preferences, and dignity are as critical as the technical functionality. [redacted] even wanted the speakers to be pink so that was something we had to spray paint!

I realized that design is not about achieving the answer first, but rather about crafting a responsive design process that accounts for partial answers. Our research, brainstorming, and prototypes were good, but primarily, the iterative nature of the pieces was the most important. This is what pushed the design to come far enough so [redacted] could be able to take it home with him. The integration of research and user testing rather than treating them as separate processes is crucial. If I were to do this process again, I would do that even more. I would make iterative testing and feedback earlier, unstick the ideas from the design decision, and problem space more before solution space. Ultimately, this project was about the design process and what was most important was that the best work comes from being responsive.

Individual Reflection - [redacted]

This class made me learn to foster an excitement for failure. As a group we would constantly try new approaches and create different models and run our ideas through [redacted]. Many of these ideas failed all of the tests and some didn't make it through most but there were only a few feasible ones that passed all of the tests and those were the ones that stuck with us. Through this class I realized the importance of creating a tight feedback circle i.e. creating a prototype running it by a user and then iterating quickly. This way we could move fast and break things quickly so that we could refine our ideas.

Out of the entire process, ideating was the most intensive but also enjoyable for me. We would spend hours at the d.school just toying around with cardboard to try to communicate our ideas to one another. Initially, we would be very set to an idea and we would think “This is it!”. However, when we kept undergoing testing, we would find out again and again that there were new alternatives and better ways of creating certain things. One big hurdle that was very difficult for us to reconcile with was that increasing the height of the heel would change the angle in the leg which makes it impossible for the person to have the same walking gait as they would normally have (their toes would be pointed into the ground and their tibia and fibula would be strained).

We continuously iterated on not only our designs but also on our methodology for the design process. For example, initially we would draw something up and then try to create it and then showing [redacted] and then the user would be best. But then we found that drawing something up and then explaining it to a user and trying to see if they fully understood it was in some cases better because they could cut the idea off immediately and say that it would be too bulky or that it would be too ugly. That way we could then go back and not lose anything compared to the initial method where we had to build the idea before we ran it past our user. We also found that there were different struggles with different materials. For example, in PLA we found that it was very rigid and had long print times. With a cardboard we found that we could create unlimited prototypes quickly. With resin printers we found long wait times in the queue and that the print itself has a procurement post processing so that the resin would form correctly. In the end we wanted to create a blown-up demo of the final product to best communicate our product.

In the future, I would have done a couple of things differently. First, I would've tried to reach out to multiple disabled individuals to try to get a broader sense of their experience and also have for more rigorous testing for the iterations of our product. If we could have reached out to more people, we could have gotten more breath of feedback for our product. Second, I would've reached out to a AMPS assistant and asked what the schedule looked like near the end of quarters because I did not expect that there would be long wait times for printers near the end of the quarter but now in retrospect it makes sense because everyone has final projects that they are all trying to finish. Third, something that we could have improved was our team communication and negotiation. Sometimes it seemed as though we were moving backwards instead of forwards. For example, we would spend a lot of time on a certain prototype and

spend a lot of time breaking down the work into different parts but then we wouldn't understand that certain parts needed others to be complete before we could start. We would assume that our teammate would finish by a certain time but then be surprised when they did not finish but it was only because they needed another part to be done before they could start. In summary, creating a clear schedule and clearly communicating obstacles and changes to the schedule would've significantly reduced the stress that we took on.

Finally, we could've benefited from having an actual mechanical leg so then we could try on the [redacted] earlier than the last couple of weeks. Although the final demo turned out great, having a mechanical leg to be able to model where the final design would've been would be helpful to showcase our design to the viewer.

[redacted] was super helpful throughout this entire process and I really want to thank him for all of his hard work and effort. He would consistently give us high quality feedback and meet up with us on a regular basis. He had a strong background based in academia and has been exposed to this market and product for many years. We are very grateful to have been able to refine and adapt to the constraints and hopefully have passed on some good ideas.

In conclusion, this project turned out to be a valuable experience for my personal and future career goals. For my personal goals, I learned how to set clear expectations and how to manage relationships. For my career goals I learned how to set timelines and interact with people in the workplace and negotiate tasks according to our skills and interests. I learned so much about user centric thinking design. Even though we may not have impacted very many people throughout this quarter, if I have learned something in this class, it is that impacting just one person is enough.

ENGR110 Individual Reflection

My experience in ENGR110: Perspectives in Assistive Technology was one shaped by expanding my world view to a broader perspective in order to better understand all people around me, of all abilities. This class challenged me to re-assess everything I do in my day to day life and imagine my life through the lens of someone who experiences challenges doing the things that I think of as simple, like going through the motions. My interactions with guest speakers during lecture helped reinforce these notions with shared experiences that detail real life situations that people with disabilities have to go through every day, such as mobility challenges, neurological setbacks, and visual impairments. Working with my project provider [redacted] was an extremely valuable experience that allowed me to apply my engineering knowledge to a project and combine that knowledge with new perspectives that I developed throughout this quarter to create a prototype that satisfied her user needs.

Throughout my design process in creating the [redacted] for [redacted], each aspect of this class contributed to our final product in some shape or form. To start with the guest lecturers, many of them shared similar setbacks or challenges to the ones that [redacted] shared with us, which gave me different perspectives of the same situation and helped with brainstorming purposes. For example, Peter's talk on designing to meet the needs of all people was extremely eye-opening. He shared challenges living with a spinal cord injury that makes him have to use a wheelchair, and how he was able to apply engineering principles and a nuanced understanding of assistive technology to design technology so that people of all abilities can enjoy daily activities.

This specific principle of designing for the enjoyment of daily activities and hobbies is the ideal that drove my specific group project. We learned that [redacted] has mobility issues and visual impairment; however, she does not want these things to inhibit her ability to draw and paint in the community. This is a hobby she has that brings her immense joy, and we felt compelled to create a prototype that will allow her to do this activity comfortably. In terms of project motivation and drive, I would say that the guest speakers and the interview with [redacted] were immensely valuable in these areas; however, in terms of the actual design process and engineering principles, learning about [redacted]'s user needs, researching prior solutions, and brainstorming/prototyping were the most valuable aspects of this class.

Upon our first meeting with [redacted], we were able to get very clear instructions from her about what exactly she wanted from us for her design, which was having a portable easel that can fit into her backpack, making the easel adjustable in the angular direction, making it light, and having it be secured onto her wheelchair. As we went through our brainstorming process, we held each of our candidate designs to these set standards to ensure that our final prototype would meet all of [redacted]'s needs. In terms of different interactions in this class that contributed to our final design, I would say that our interactions with [redacted] were the only ones that really played a large factor in what our design ended up being. After fabricating a few low-fidelity prototypes, we met with [redacted] again to get her feedback, and she was able to

let us know what was going well and what wasn't working and provide even more context on what she wanted specifically. After this meeting, our team was able to iterate by pulling positive aspects of each of our designs and combining them into one final prototype that would fit all of [redacted]'s needs.

If I were to go through this process again, I think my team and I would agree that we could have spaced out our work better throughout the quarter. We had spurts where we were doing a lot of work and making a lot of progress, and other periods of time where we felt stagnant. This is also just reflective of the nature of a group project in the midst of other classes happening at the same time, as three of the four of us were also in ME170B at the same time as this class. I wish that a greater chunk of the in-class time was focused on the group projects; specifically, how to purchase materials on the online order, what design processes we should be conducting, what fidelity our final design should be, etc.

For future students, I would advise you to go to class every day, and to really take in the content that the guest speakers are giving you. Even if you think that they aren't relevant to your final project, these speakers provide invaluable knowledge and perspectives that could both shape your project decisions and offer new perspectives that will help you beyond this course. It's a great course, so take advantage of everything that it has to offer!

[redacted]
ENGR 110
David Jaffe
15 March, 2026

Individual Reflection

To start this reflection, it's important to situate where I learned about this course and why I took it. I came across it while browsing technical elective options for my major, mechanical engineering. It immediately caught my attention as I had never heard of an assistive technology course before and was genuinely excited to find something that aligned my personal interests with the requirements for my degree.

I have always been drawn to assistive technology because of my proximity to medicine and disability throughout my life. I was born with a rare form of sickle cell disease, which often limits the types of physical activities I can participate in as well as many of my lifestyle choices. One area that I have explored on my own is the notable lack of assistive technology designed specifically for this condition. Resources are consistently under-allocated for sickle cell disease, and I care deeply about addressing that disparity. These personal experiences have given me a strong sense of purpose, and I took this class to broaden my understanding. I wanted to learn more about the experiences of others, to see how assistive technology shapes their daily lives, and to understand how people are working to create solutions that improve the quality of life for those with disabilities.

The highest value class activity for the design process was undoubtedly interacting with and learning from our community members. In particular, working on the Magical Bridge project gave us access to [redacted], who brought an extraordinary depth of knowledge about the perspectives of individuals with a wide range of disabilities. We were so lucky to have her, someone so informed and engaged, to answer our questions and provide feedback on our design. It was also meaningful to be able to visit the playground in person and observe firsthand how both children and adults interacted with each other and with the existing playground equipment. Seeing the space in use gave our design work a sense of grounding and purpose.

In a similar sense, I found our initial brainstorming with our instructor to be helpful in starting the design process off. It was clear from Dave which ideas he felt [redacted] would like most and which we should reconsider. This meeting and early guidance gave our team a stronger sense of direction and confidence going forward. Additionally, I felt that the physical prototype fabrication stage was a highly valuable component of the design process. There is definitely a difference between planning a design on paper or creating a digital mockup and actually holding a physical prototype, interacting with it, and beginning to understand how our user might experience it. The prototyping process shifted how we thought about our work and its implementation.

The various interactions in class, particularly with community members, influenced my perspective when creating our design. With each new guest speaker in lecture, I gained a better and more nuanced understanding of the challenges and desires of the people that we were designing for. The lectures helped situate our individual projects within a larger context and reinforced why the work we did really mattered. I appreciated the opportunity to hear from such influential and accomplished people in the field of assistive technology. One interaction that especially stood out was when the student panel of Stanford students with disabilities spoke to us. I was glad to be able to learn more about my classmates, the challenges they navigate on campus daily, and the areas in which the university has room to improve. It prompted me to think critically about the amount of work we all can still do around campus to make it truly inclusive.

If I was able to go through this process again, I would have spoken more to other project suggestors beyond our community partner. As mentioned, these interactions were among the most meaningful parts for me in this class, just learning more about their story and life experiences. I would welcome the chance to connect with more people, hear more stories, and carry those perspectives more deeply into the design work. Overall, I felt that the teaching team was incredibly supportive and helpful in troubleshooting for our project or just generally answering any questions that came up throughout the design process. I intend to recommend this course to anyone in the grades below me, not even limited to mechanical engineers. The learning that comes from getting to know people directly instead of designing based on a prompt on paper is so special and unique and anyone would be lucky to experience it!

[redacted]
March 16, 2026

Individual Reflection
ENGR 110

Throughout this course, I developed a much deeper understanding of what it means to design for accessibility, not just in terms of physical access, but also in terms of social, emotional, and sensory inclusion. Working on the All Play project, where my team and I designed an inclusive Kindness and Conversation Wall for the Magical Bridge Playground in Palo Alto for [redacted], allowed me to experience the full human-centered design process from initial observation to prototyping and testing. This process was significantly more iterative and user-focused than any design experience I have had before, and it reshaped how I think about engineering problems.

One of the most valuable aspects of this project was the emphasis on user-centered design. Rather than jumping directly into building a solution, our team spent a considerable amount of time observing the users at the MBP and directly asking [redacted] the playground's needs, rather than just creating something that looked cool to us, able bodied team members. For example, during our visit to MBP, [redacted] brought it to our attention that the Kindness Corner was underutilized compared to other areas. This observation became a key turning point in our design process. Instead of designing something entirely new, we focused on improving an existing space in a way that aligned with the playground's mission of kindness and belonging.

Among all stages of the project, user interaction was most valuable in shaping our final design. Seeing how children and families naturally interacted with the playground revealed gaps that were not obvious through research alone. For instance, we observed that while many playground features supported physical activity, there were fewer opportunities for structured social interaction, particularly for children who may struggle to initiate conversations. This insight directly led to the development of our conversation prompt system and emotion wheel, which were designed to reduce social barriers and encourage communication.

Interactions with professionals and community partners like [redacted], were game changing. Her feedback on our initial idea of the "sensory maze" helped us narrow our focus and prioritize sensory, as opposed to maze, and lead us to our final idea. Her insight about the underuse of the Kindness Corner helped us recognize where our design could have a legit impact on the users of the space. This guidance was especially valuable because it grounded our ideas in real-world constraints and needs, rather than purely theoretical design thinking.

Guest lectures and class discussions also contributed to my understanding of inclusive design, especially in recognizing that most disabilities are not purely physical. Learning that a large percentage of disabilities are sensory or cognitive challenged my initial assumptions about accessibility. This influenced our decision to focus heavily on predictable interactions, low-pressure communication, and emotional expression, rather than only physical accessibility.

These concepts became central to our final design, which emphasizes tactile engagement and structured conversation prompts.

The brainstorming and concept development phase were also an important parts of the process. Using tools like the Inclusion-Innovation Matrix helped us evaluate ideas in a more structured and objective way. Instead of choosing concepts based on personal preference, we were able to compare them based on accessibility, engagement, and feasibility. This helped our team justify why the Conversation Wall was the strongest solution compared to alternatives like the maze tunnel or water ideas. I found this method particularly useful because it provided a clear framework for decision-making in a team setting.

Prototyping and testing were also valuable, but in a different way. While our prototype was relatively simple, it allowed us to test key aspects of the design, such as whether users could understand how to interact with it and whether the prompts encouraged conversation. One of the most important takeaways from testing was how intuitive the design was because users would be able to interact with the rotating tiles without any instructions. This reinforced the importance of simplicity in design, especially in a playground environment where users may have varying abilities, ages, learning levels, and attention spans.

Personally, if I were to go through this process again, there are several things I would do differently. First, I would try to incorporate more direct user testing with children earlier in the process. I never got to ask any children exactly what they thought the park was missing. Maybe interacting with [redacted]'s daughter more could've satisfied this need. Also having tested with a broader range of users, particularly children with different abilities, could have provided more detailed feedback and allowed us to refine the design further. I would also spend more time exploring material selection and engineering feasibility earlier on, as many of the challenges we identified later such as durability and weatherproofing that could have influenced earlier design decisions.

In terms of course support, I found the guidance from the teaching staff and structured milestones to be PERFECT in keeping our team on track and helping us succeed. The progression from brainstorming to prototyping to final reporting was well organized and encouraged steady progress. Overall, the most valuable takeaway from this experience was learning how to design with empathy and intention. This project taught me that inclusive design is not just about meeting accessibility requirements, but about creating experiences.

[redacted]
ENGR 110
Individual Reflection
3 April 2026

I picked ENGR110 because I thought it was a project class that was interesting but more of a filler class as a relief aside from my hard-core classes. I am so glad I found it because it became very fulfilling and I learned so many technical skills as well as soft skills through the guest lectures and the final project. I've gained skills like teamwork, designing for someone, learning how to wire a breadboard, calibrating sensors, and C!

I enjoyed the guest lectures greatly, specifically the one about brain waves translation into speech. I remember calling my dad after and describing how cool it was to have direct input of thoughts be used for good and to help those who cannot talk. Usually, there is this preconceived notion that allowing access to your brain is an invasion of privacy and can do more harm than good, but it was inspiring and refreshing to hear how it benefitted so many people to speak their minds. I also really enjoyed the Assistive Technology Faire. I particularly liked how each booth was so considerate and prioritized listening to their customers and completely trying to understand them instead of directly looking for profit and progression. Talking to the Lotus CEO was wonderful because he put such effort and care into cultivating relationships with people before deciding his ultimate product idea, which shone through his work of toggling the light switch with a ring. That is something I will take with me when designing future projects and as a mindset for future entrepreneurship.

By learning through directly meeting [redacted] and [redacted], I felt like I got a glimpse into understanding their experiences and how they need to be cautious about certain things I take for granted. I admired [redacted]'s genuine curiosity in the guest lectures and his decisiveness about what he wanted for the product but also his patience when we ran into technical difficulties. This made it helpful to know exactly what the criteria should be and the design, but also gave us grace throughout the process so we could adjust from our mistakes. Only then, could we design to his needs and find the best way for sensor placement and sensor choice.

By doing the project, I learned the pros and cons of sensor choices, and how designing for wheelchairs is not as straightforward as I realized. It was intriguing to read about the short ranged infrared sensors, the wonky ultrasound sensors, so we relied on a newer model of LiDAR. I helped set up the ultrasonic sensor on the breadboard and into the case, while implementing the state machine. I also helped set up a Bluetooth connection between the two microcontrollers. Along the way, I reflected and realized how important it is to differentiate between hardware and software bugs, and to be aware of shorting circuits (which are easier than you think). To understand when the connection is lost vs the code is incorrect relies on experimenting with different wires and switching heads, even the battery power of the computer. Thanks to [redacted]'s guidance, I learned so much about how to connect it to batteries and the navigation of the breadboard, making me reconsider my major from CS to EE. Next quarter I plan to take some RISC-V classes! We ended up creating a functional prototype that can detect the different states which was very exciting because after endless nights of

debugging in Crothers and Packard, it seemed like the end was not near. We hit a milestone, but not the end yet. In the future, I would like to revisit this project and improve its accuracy of the ultrasonic angle and rework the LiDAR! This class gave me good friends and a good time. I think my group was very diverse in ways I didn't expect. First, we were all at different grade levels and had specialties in different things. [redacted] was in charge of CAD models, I was mostly software code and integration, [redacted] picked the sensors and set up the breadboards, and [redacted] was our product manager / overall assisting. Yet, I think our differences made us stronger because everyone was respectful and passionate about the project. I learned so much from each of them and am grateful that I randomly decided to pitch in that one day. Thank you again for a fruitful and amazing class, I will remember it forever through our speaker box and memories!