



## The IMPACT Center Podcast – Full Episode Transcript ImpacTech Episode 34 - " Designing Dignity "



### SPEAKERS

Dr. Mary Goldberg, Taylor Allen, Sreejith Ravi

Mary Goldberg 0:04

The IMPACT Center at the University of Pittsburgh, supported by the National Institute of Disability Independent Living, and Rehabilitation Research, proudly presents ImpacTech. Welcome to season four of the ImpacTech podcast. On today's episode, Designing Dignity, we're meeting the student innovators behind TREAT-MATE, the RESNA Student Design Challenge winners of the Impact Award. Their clever solution helps wheelchair users independently treat and bond with their pets. We'll explore how the team identifies this need, what it took to bring their idea to life and the lessons they learned along the way. Recorded remotely from my soundproof bedroom closet in Pittsburgh, PA, this is your host, Dr. Mary Goldberg, and welcome to our 34th episode of the ImpacTech podcast series. Okay, so Taylor and Sreejith, can you please both briefly introduce yourselves and your role on your team. Hello.

Taylor Allen 1:06

Yes, I'm Taylor. I am actually the only PhD student in our lab currently, and essentially, you know, along with doing my own personal PhD research, essentially, I was in the lab at the very beginning of this treat dispenser project. So I'll flow into when Sreejith became the lead of this project.

Sreejith Ravi 1:28

Thank you for the introduction. And I'm Sreejith Ravi, and I'm one of the student innovators from the Georgia Tech team. So my work on this project was focused on the mechanical design and prototyping, and to talk about myself, I did my bachelor's in mechanical engineering from India Government College of Technology, and currently I'm pursuing my master's in mechanical engineering from Georgia Tech, and I'm deeply interested in mechanical design and prototyping.

Mary Goldberg 1:55

Yeah, tell us what sparked the idea for treatment. Was there a specific moment or experience that that led you here? Yeah.

Taylor Allen 2:05

So I'll jump in here. It's a little long winded, but I promise it comes together. So, so I'll kind of start off by saying, in the past few years, kind of one of our main objectives in the lab, it has been learning, kind of how to optimize and improve assistive technology prototypes for small batch production. So essentially, this means kind of taking a functional prototype and refining it to be feasible for low volume manufacturing, so ensuring that the design can be kind of efficiently produced, assembled and distributed in small quantities, while also making sure, obviously, that the product still meets, you know, stakeholder needs within its intended context of use. Our advisor, Dr. Sprigle, consistently says that the last 20% of design is the hardest, and that really is so true,

especially for assistive technology. So kind of going off this, you know, learning process of small batch production in order to practice this process, our lab was interested, actually to see if we could utilize DIY maker sites to identify promising low volume prototypes that we could then advance to small batch production designs. Typically, we get project ideas kind of either from our advisor, and another way that we get ideas is through our collaboration through the Shepherd Rehabilitation Center here in Atlanta. So like clinicians and patients from the Shepherd Rehab Center have brought us, like several promising ideas that we've moved into kind of small batch production level. In this case, though, obviously we look through first kind of general DIY websites like Thingiverse and Instructables, as well as at centric maker sites like makers making change, which is kind of it's run by the Neil Squire Society.

So kind of, looking through these, these DIY websites, we were able to find several promising options to kind of move forward with. And one of them was a wheelchair mounted dog treat dispenser. And this was actually around the same time that our advisor was preparing to teach a new rehab engineering course at Georgia Tech. So one of the teams in that course was given the wheelchair dog treat dispenser, and this initial prototype that we found was a fully 3D printed product that technically just used a simple kind of funnel and lever system to dispense treats. And it also incorporated, like a little slot for a clicker training tool, so that every time the lever, you know, dispense the treat, it also clicked the training clicker. So obviously, this was, you know, an interesting idea, promising idea, but the prototype.

It definitely had several flaws. And there was actually a post that a wheelchair user made on the same website where he was asking for a wheelchair mounted treat dispenser. He described like his individual needs that he wanted for this product. And also pointed out a few flaws in the original DIY, you know, posted prototype. So going into this assignment, these students obviously did have a pretty good understanding of, you know, the user's needs and the improvements that that needed to be made in this product. So they did have a good amount of information, you know, taking on this project. So the students did focus on a couple of different things in this process. Focused on making the product more compact. They incorporated a longer dispensing handle to, you know, to improve ease of use, but their main change was changing the dispensing mechanism. So instead of using just like a simple funnel and lever to dispense the treats, they actually incorporated a torsion spring that rotates a hopper inside of the device, so that the treat could be dispensed still with minimal force and range of motion, the handle kind of reverts back to its original position, so that there's no kind of extra effort on the user. So, you know, although they were improving the design for small batch production, they weren't really able to address all of the issues with their updated design. So our lab, the REAR Lab, it's the Rehabilitation Engineering and Applied Research Lab, we still thought the product could be improved and optimized, so we brought it back into the lab so that we can further update it. That is essentially how it ended up in their hands.

Mary Goldberg 5:36

What a cool collaboration and amazing experience for the more junior students to be a part of this experience. And certainly the problem that you're tackling is so authentic, all things considered, right? So the small batch production with like niche markets in it is a real challenge. The products that have been designed with a particular user in mind yet, you know, perhaps they weren't consulted, so some of those key features and needs, obviously, were missed along the way. And so that is yet another amazing teachable moment for the junior students to take on. And I know that Dr. Sprigle is such a well regarded expert in this field, and has worked across

a wide range of at so really awesome to have him at the helm. Shrejith, do you want to add anything to the design process? Perhaps some challenges that you faced once you've taken over the leadership on the design development? Sure.

Sreejith Ravi 6:06

So the design challenges that we faced could be split into majorly four sub topics, and the first one being mounting and wheelchair compatibility. So this was perhaps one of the biggest initial challenge. Power wheelchairs are incredibly diverse in their design, so creating a one size fits all solution was not an option for us in this scenario. So the original user request on the makers making change website specifically asked for a device that could mount easily to a power wheelchair without introducing the bulk. So we knew from our market research that other devices were often not compatible with most power wheelchairs or was simply too bulky. So our solution to this was to develop not one but three distinct mounting options to offer users flexibility. The first mounting option being a spring clip mount, which uses an off the shelf component and a cinch strap for an secure and easy to snap on option. The second option being a 3d printed slide mount that allows the dispenser to easily slide in and out of a bracket secure to the chair. And the third and final option being a bottle holder mount that utilizes another common off the shelf component to provide a secure and adjustable fit. We validated these solutions through extensive wheelchair mounting compatibility testing at the Shepherd Center, and that's how we figured out the mounting and wheelchair compatibility issue.

Another design challenge that we faced was treat compatibility and dispensing reliability. So a treat dispenser that jams is not very helpful, right? So we had to design a mechanism that could reliably handle various treat shapes and sizes. This was a core focus of our prototyping phase, where we specifically tested for flow. Of treats or treat jamming. A great example of this challenge was that our dispensing mechanism, it initially used a 180 degree torsion spring to rotate the dispensing disk. However, through testing, we realized that a 90 degree torsion spring required less actuation force from the user, and it also provided more reliable, consistent dispensing. Furthermore, based on direct user feedback, we addressed treat clogging by increasing the size of the spout opening to prevent the treats from getting stuck. So this was a second design challenge. The third one was assembly, packaging and maintenance, since our goal was to design a product that would support small batch production and be shipped to users, ease of assembly was very critical to us, we challenged ourselves to create a design that required tool free assembly.

The key innovation here was to use all snap fit components. This approach simplifies everything. It makes the initial assembly intuitive for the user, allowing for easy disassembly, for cleaning or maintenance, and it also makes the device more compact for efficient packaging and shipping. So we made sure to test for ease of assembly throughout our development process. And the fourth and final design challenge that we faced was 3d printing optimization and safety. Since this, this was a pet use product, it had to be food safe. And since cleaning was also a priority, we made sure that the product was dishwasher friendly. So we, we designed the whole product in food safe and dishwasher safe material petji, and this was non negotiable to us from the start.

Mary Goldberg 11:47

Thank you. How many clients from the Shepherd Center provided this feedback, and how did you navigate if they gave you differing feedback? How did you navigate that variability, and how did it inform subsequent design changes?

Taylor Allen 12:06

So thankfully, when the students had this project, they did go to the Shepherd Center and try a couple of different wheelchairs that were there, but they focused on kind of more like a service delivery model, which you guys have probably heard that term, where we have one kind of power wheelchair in the lab that we use for a lot of design, and their mounting kind of worked fully on that one. But then later in their kind of project, they they went to the Shepherd Center to kind of get a little bit more feedback from clinicians and to test it on other wheelchairs. And basically that's when they found out that the mounting was not going to be a one size fits all. But by the time that it got to Sri, he was more focused on kind of the design for manufacturing and assembly and just refining

Mary Goldberg 12:56

the product. Sounds like the protocol was very solid. Then could you walk us through what were the users asked to do, specifically to try the different features?

Taylor Allen 13:09

Essentially, as of now, we have only tested it with with one power wheelchair user, but he still has it on his power wheelchair. He's kept it on there since we gave it to him, so he really likes it.

Mary Goldberg 13:20

That's awesome. You got an early adopter right away? Yeah, great.

Taylor Allen 13:25

Exactly, yes. So for the one person that has tested, it kind of an interesting story, how that came about as well. So I have a friend that lives in Decatur, and I was leaving her housing, you know, complex, and I saw a mom and a young, younger boy, maybe around 11, and he was in a power wheelchair, and they were also walking around a dog. So it kind of checked a couple of the, you know, the user target user boxes. So I wasn't going to stop at first, but I was like, you know, you never know. So I stopped and started to chat with them, and they were really interested in trying this product, I think that they adopted the dog a couple of weeks ago or a couple of months ago, and they were still trying to create that, that bond. And so they were, yeah, they were ecstatic. So essentially, we brought them, kind of the three different mounting options and let them choose. You know, we saw what was best for for him, which ended up being the off the shelf water bottle holder because we mounted it on a tubing on his power wheelchair. And I will mention really quick that the the two mounting options, the spring clip and the slide mount were mainly developed to be put on the armrest of the power wheelchair, and then the off the shelf. Kind of water bottle holder was mainly for like, if you wanted to put it a little bit lower in the back, like it. Allowed you to kind of put it on any tubing that you want. And then it also offered this could change the angle of the the position of the water bottle as well.

So just a little bit more customization, and that's what this user chose to put on his wheelchair. And essentially, we said, you know, use your treats. Let us know if, if those treats don't work, you know, we wanted to know the size and the shape. Use it for a couple weeks, and then we'll come back and we'll chat about, you know, some of the, some of the issues that you had.

Sreejith Ravi 15:33

So some of the user feedback that we got, and some of the changes that we made to the final design, the prototype, was first, we adjusted the handle length to better accommodate different levels of grip and dexterity. So initially we had a smaller handle, and then after from the user feedback, we increased the length of it to make it more compatible for the user. And then the other change that we made was tightening the snap fit mechanisms. So in our first prototype that we delivered to the user so it had loose snap fit components, and as a feedback from them, we then changed those snap fit mechanism, made it more secure. And so that was our second change. Third one was we rounded the edges on the lid to make the opening and refilling much more easier. Another change that we made was we redesigned the snap fit tray. So in our initial design, the snap fit tray was not very it had a rotation within the frame itself, so we had to get rid of that so it wouldn't rotate out of position. So we redesigned the snap fit tray. And one of our final changes that we made to the design from user feedback was the treat clogging issue, so we increase the spout opening size to prevent treats from jamming. So all of these changes were made from direct user feedback, and each of these changes came directly from observing and listening to users.

Mary Goldberg 16:57

It's been fun listening to what the user feedback was and how it impacted your design. I would love to hear about the pet feedback. So what did they think? Did they respond? Were they freaked out by, you know, more of the automatic nature and less involvement from the user. What did you hear about them and their reaction?

Taylor Allen 17:18

Yeah, so one of the most amazing things that we heard was that the dog was essentially falling around the power wheelchair user after, you know, he started using this product. So, you know, before they had, they had a good relationship, but the dog would kind of go around the house or whatever, do its thing. But now this dog was basically, you know, not begging for treats, but essentially sitting near his wheelchair almost all day. So it definitely did increase kind of the bond that this, this child, was having with his dog, which was pretty much the main goal. You know, of course, we wanted to develop a functional product, but really the main goal was to increase this real time interaction with power wheelchair users and their their pets and, you know, strengthen the bond that they have. So that was one of the main amazing things that we heard. We didn't hear any negative things, of course, from the dog, you know, he, he apparently enjoyed it. They didn't say anything negative about kind of how it reacted, you know, it's not, it's fully, you know, mechanical. It's not electromechanical at all. So there's no really sound that's going to scare him. I will mention, though, that we have heard from a couple of individuals. I think actually, one of the judges at the design competition said that, you know, my dog's very smart, and he may figure out how to operate this, this product on his own, you know, move, move the lever with his, his little nose or something. So that is one concern that we would like to kind of evaluate in the future. You know, if bigger dogs, or smarter dogs can kind of figure out how to spend dispense treats on their own. Would that be an issue? But it was not an issue with this initial user, thankfully.

Mary Goldberg 19:10

I'm thinking of Pavlov's dogs experiment, as you say that right there. I mean, I feel like that's 100% like their immediate reward, right for figuring this out. So, yeah, I really liked what you said about strengthening the bond and certainly helping, I think, to lessen, you know, some of that isolation that in an individual who uses a power wheelchair may be more likely to feel and you have me thinking about additional applications for this device, especially where that bond is so critically important, like in therapy dog programs, for example. So what do you see as the future application and how to expand your markets here?

Sreejith Ravi 19:58

Yeah. So from our perspective, we feel the human animal bond is very vital. And pets, whether they are highly trained service animal or emotional support animals or simply companions, they play a huge role in the lives of many individuals with disabilities. So that bond is nurtured through daily interactions, and giving treats is a primary way to communicate with them, and so when a physical limitation is creating a barrier to that act, it can actually weaken the connection over time. So and as an answer to the question, we believe that innovations like treat me, it can actually help reduce the feelings of isolation, and it will definitely have a positive impact on their mental health and also by restoring a person's ability to independently engage in this activity. It's not about just dispensing food, it's more of, you know, inculcating the connection and promoting the emotional well being and having such a product also empowers the user and strengthens their role as a caregiver and companion, and it also gives them independence. And we feel that that is more important, rather than it just being a product which dispenses treats for the dog, it gives freedom to the individual. It empowers the connection between the pet and the user. For the further applications of this product, maybe this could be used as dispensing medicine for the pets. That would require a lot of research and development, but we feel there is opportunities there as well?

Taylor Allen 21:41

Yeah, and I'll just add definitely manual wheelchair, power wheelchair, we've briefly talked about an option for like a walker or a rollator as well, but those are kind of some, some other areas that we potentially could see this product be helpful as well.

Mary Goldberg 22:01

Yeah, I think you've got a ton of opportunity here, for sure, and really should be so proud of yourselves, so amazing that you won the RESNA student design challenge. So that's the rehabilitation engineering and assistive technology Society of North America. They always run a student design challenge as a part of their conferences, and more recently, have been partnering with larger conferences, which really helps to increase, obviously, exposure overall to the great research across fields. But certainly for those who Expo exhibit like yourselves. I'm sure you've got a lot of additional feedback too, from just even the audience. Would love to hear from you both about what this experience meant to you, sure.

Sreejith Ravi 22:52

So participating in the Rena student design challenge was a really great experience that allowed us to put our design into practice. So me, being an international student, this was my first experience attending design conference and participating in a student design challenge, and this challenge pushed us to go beyond just

engineering, and we considered was the human factor that involved in creating an assistive device, and also the process of identifying a clear problem and developing a tangible solution was incredibly interesting and rewarding, and I feel like this experience reinforced the importance of inclusive design and to make products accessible. That's what I learned from the whole design challenge, student design challenge.

Taylor Allen 23:38

I definitely agree with Sreejith. I had very similar feelings. The only thing I think I can add is that we were surrounded by many people in the industry that have made amazing things and done amazing research, and just to be around you know, that kind of energy is so inspiring. I really look forward to potentially working with a lot of people that we've met through this experience as well.

Mary Goldberg 24:05

Yeah, an amazing networking opportunity, for sure. So you both have this unique perspective of being a student yourselves, but also mentoring more junior students. So what advice would you give to other student teams that are just starting out in assistive technology.

Taylor Allen 24:24

I guess I'll start with this one. It is something that we've learned from Dr Sprigle as well, and that is, context is everything. So you can make an amazing product that is functional and does what you designed it to do, but it may not actually incorporate with the user's daily activities with their assistive technology. So bringing in those stakeholders early and often is extremely important in this field of assistive technology and rehab design.

Mary Goldberg 24:57

So what's one big lesson that you learned about. Inclusive design that you'll carry forward. It sounds like in general, just learning more about this process has really reconfirmed or affirmed your interest in this field, in general. But what's a What's your primary takeaway here?

Sreejith Ravi 25:16

To me, the one thing that I've learned is how to design a product having the human context. How can you design a product which can be helpful to a human? I think that is the core of inclusive design, right? And this has also improved my interest in designing more assistive technology products. So talking about that, currently I'm developing a mouth interface for disabled people who do not have hands and legs and musicians to help them, you know, play percussion instruments. So I feel that has inculcated this interest in me to design products for people with needs.

Taylor Allen 25:57

I can add one other thing to, you know, what we've learned that will help with Inclusive Design? Obviously, through this kind of small batch production process, we've had to focus more on low volume manufacturing that is cost effective, and, you know, practical for these individuals, because we're not having them buy \$100 treat dispenser, even if it's amazing, we really have to understand that the balance between offering independence and then putting this this cost on them, but the value of small batch production and low volume manufacturing has definitely increased in Recent years as well, obviously, with 3d printing and other, you know, additive

manufacturing techniques, there's a lot of new technology that hopefully will increase the, you know, viability of some of these products that we're creating. Because we don't have to just opt for injection molding. This new kind of surge of low volume manufacturing and rapid prototyping will also help increase the market viability of assistive tech.

Mary Goldberg 27:12

That's great. And so, yeah, what specifically do you see as the pathway to market, then for treatment?

Sreejith Ravi 27:21

So currently, we are focusing on putting our product designs on websites like Instructables, where people can go on, download the design, print for themselves and use them. So we have not looked into, you know, making this a commercially as a product that you can buy, but we are happy to, you know, print them and send it to your users who actually need this product

Taylor Allen 27:44

and you can share. We definitely are willing to make these products, you know, for free, send them out to people to get any feedback. If, in the future, our lab is interested in trying to market because it's not the main goal of our lab, you know definitely that the goal is to deliver a product that works and that improves, you know, these individuals quality of life, as Sreejith said, you know, for now, treat me. We want to just send out and as many as possible for people who are interested, and a couple further last minute changes based on their feedback.

Mary Goldberg 28:20

Nice, yeah, it's so helpful to be able to use and employ again this tried and true formula of already having done this in your lab and leaning on on mentors and so on and and obviously want to offer and extend our impact centers help as well keep us on your list as as cheerleaders in your corner and really, really pleasure talking with both of you today. So thanks so much for taking the time and and we wish you the all the luck, of course, with treat meat as well. So would you be able to indicate where listeners can find out more definitely.

Taylor Allen 29:05

Yeah, so our website, which is rear lab.gaek.edu, really, you can go to that website and just shoot us an email and we'd be willing to build one and send it out to you.

Mary Goldberg 29:19

That's a great offer. Thanks so much, Taylor and Sri again for taking the time, and we'll hopefully catch up with you soon. Thanks for joining us for today's conversation with the Georgia Tech team behind treat mate, winners of the RESNA student design challenge Impact Award, their user centered approach and commitment to accessible interaction reminded us how even small moments like giving a treat can carry big meaning. To learn more. Visit the rear lab. At rearlab.gatech.edu. Up next, we'll be talking with Shay Cohen, co founder and CEO of Verballi, about how AI is reshaping communication for AAC users around the world for more stories of innovation at the intersection of technology and inclusion. Follow the IMPACT Center at idea2impact.org and subscribe to ImpacTech wherever you listen to podcasts. If you like ImpacTech, please review us on Apple podcasts or

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Mary Goldberg 30:43

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