SHORT-PAPER

# "It only needs to work for one of us": Rethinking DIY Deaf Tech Through Situated Co-Design

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# "It only needs to work for one of us": Rethinking DIY Deaf Tech Through Situated Co-Design


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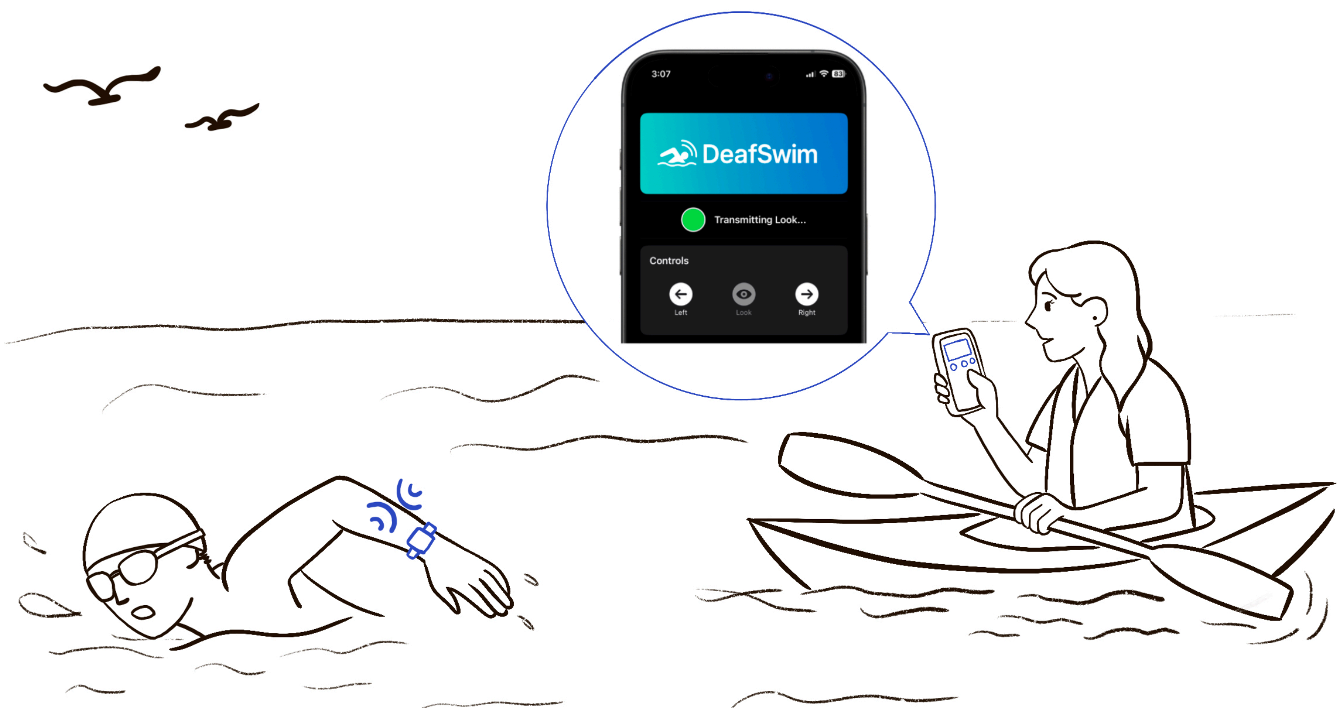


**Figure 1: Illustration of a Deaf swimmer and a kayaker. The kayaker uses the DeafSwim app on a smartphone to send a vibration alert to the swimmer's smartwatch to gain their attention.**


## Abstract

This experience report presents a real-world case in which a Deaf open water swimmer and their hearing kayak partner designed and developed a vibration-based system for attention signaling during long-distance swims. When mainstream accessibility tools failed to meet their needs, they built a lightweight, context-specific solution grounded in Deaf cultural practices and embodied knowledge. Through in-situ use and reflective practice, we examine how this do-it-yourself (DIY) tool emerged from relational design and Deaf-centered philosophy. Rather than offering a generalized solution, this work highlights the value of culturally grounded, small-scale technologies shaped by the lived experience of a Deaf swimmer and their collaboration with a hearing ally. We conclude with a




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call for research approaches and design platforms that empower Deaf communities to create technologies rooted in their own values, environments, and ways of being.

## CCS Concepts

• **Human-centered computing** → *Accessibility theory, concepts and paradigms.*

## Keywords

Deaf and Hard of Hearing, Assistive Technology, DIY, Situated Design, Deaf-hearing collaboration, Disability

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# 1 Introduction

The first author, Huffman, is a Deaf open water swimmer, and their hearing friend, referred to as P1, accompanies them by kayak during long-distance swims. In response to the challenge of maintaining communication across distance and limited visual contact, where common Deaf attention strategies like flashing lights or physical tapping are impractical, the pair created a field-deployed system called *DeafSwim.* This smartphone app allows P1 to send vibration signals to Huffman's smartwatch, using three distinct patterns to indicate course correction or request visual attention. Rather than aiming for general use, the system offers a situated solution shaped by Deaf cultural practice, environmental reality, and mutual trust.

This experience report presents a design philosophy grounded in a specific, high-stakes context drawn from a Deaf individual's lived experience and their collaboration with a hearing ally. Rather than treating accessibility as an abstract problem of retrofitting mainstream technologies, we explore how Deaf individuals and their communities can create tools that emerge directly from cultural knowledge, environmental awareness, and the relationships that shape their everyday interaction.

This case invites a broader design question: How can we support Deaf communities in developing context-sensitive, culturally grounded tools, even when not intended for broad adoption? We argue that accessibility research must move beyond abstract inclusion and instead support small-scale innovations grounded in community values, relational insight, and lived expertise. This includes rethinking how collaborators and co-designers can act as active allies who take on shared responsibility and engage in mutual respect. This report does not present a universal solution. Instead, it offers a possibility, rooted in dignity and the everyday creativity of Deaf life.

# 2 Background and Related Work

## 2.1 Deaf Communities and Communication Practices

The Deaf and Hard of hearing (DHH) community encompasses diverse identities, including Deaf, deaf, hard of hearing, and Deaf-Blind [7, 48]. Scholars advocate for a cultural framework over the traditional medical model to highlight the strengths of the Deaf community [31]. The term *Deaf,* with a capital "D," refers to individuals who identify with Deaf culture and primarily use sign language [9, 31, 39]. In contrast, *deaf* and *hard of hearing* describe hearing loss without necessarily implying cultural affiliation [7, 9, 39].

Deaf cultural norms center on visual, spatial, and embodied communication [30, 39]. Interactions rely on eye gaze, facial expression, and the use of sign language. In Deaf cultural norms, gaining attention involves respectful strategies like tapping, floor vibrations, flashing lights, waving, or asking others to assist [30, 38]. These practices reflect shared spatial awareness and visual sensitivity [18], shaped by movement, environment, and bodily rhythm. However, poor lighting or visual obstructions can limit their effectiveness [29].

Allyship plays a growing role in Deaf communities, particularly in contexts where hearing individuals work closely with Deaf people, such as sign language interpreting, advocacy, and collaborative design [52]. Hearing allies support and advocate alongside Deaf individuals while acknowledging hearing privilege and the impact of audism [24][1]. This reflects the social model of disability, which locates disability in structural barriers such as the lack of signed communication or cultural understanding, rather than individual deficits [47]. In this framing, allyship is not about *helping* but about actively *redistributing power*, sharing responsibility, and supporting relational autonomy.

## 2.2 Deaf-Centered and Community-Driven, Situated Technology Design

DHH individuals have historically adopted a wide range of technologies to support communication and daily life [15, 29, 35]. These include audio-based tools like hearing aids and cochlear implants [15], as well as text-based and visual platforms such as speech-to-text software [29], SMS, video calling, and even fax machines [40]. Yet for many Deaf users, especially in atypical contexts such as outdoor or safety-critical environments, modified versions of hearing-centered tools often fall short [4].

A common practice in mainstream design is to retrofit accessibility "after the fact [54]," such as adding captions to videos originally created for audio consumption and turning sound notifications into vibrations *after* realizing DHH users don't hear them. These retrofits, while helpful, often come with significant limitations and do not fully address the needs of Deaf users. Increasingly, designers emphasize the importance of technologies built from the ground up with Deaf people at the center [3]. This shift parallels the rise of community driven, situated design approaches. Underserved and underrepresented communities often face challenges that are not just different from those of the dominant population, but shaped

[1]Audism refers to discrimination against DHH people based on the belief that hearing people and hearing culture are superior [8].

by systems and structures that fail to account for their needs. In response, researchers have adopted frameworks like design justice [14], which call for moving from "design for" to "design by," ensuring not only participation but leadership by community members [5, 33, 36, 45].

This report presents an experience centered on Huffman, a Deaf open water swimmer whose needs were not met by existing mainstream technologies, and P1, their hearing exercise partner, long time friend, and ally. Rather than adapting hearing-centered tools, their solution emerged from a specific cultural and situational context. As Angelini et al. argue, technologies for Deaf communities should be grounded in Deaf experiences and cultural values from the start [2, 5]. In their ASSETS work *Experiencing Deaf Tech: A Deep Dive into the Concept of DeafWatch*, they ask: *"What if we detach from hearing centered ideologies and shape technologies that prioritize and cater specifically to the lived experiences and desires of deaf people? [4]"*

## 2.3 DIY Accessibility Tools

The practice of disabled individuals designing tools for themselves has a long history [11]. Hamraie introduces the concept of *crip knowing-making* to describe how disabled people's embodied knowledge and material engagement with their environments have historically driven innovation [22, 23]. Today, widely available devices like smartphones and smartwatches have become central to this practice, especially when paired with software that supports diverse abilities [53]. Scholars have explored DIY approaches as more inclusive, personalized, and flexible alternatives to traditional accessibility solutions [6, 50]. When conventional retrofits fall short, DIY methods enable individuals and communities to create solutions that are deeply situated and context responsive [28]. Yet, despite this long history, Deaf participation in DIY remains underrepresented in HCI literature. Barriers include limited access to maker spaces, educational resources in sign language, and broader gaps in awareness of Deaf cultural and lived experience [49]. Our work contributes to this conversation by presenting a case study that highlights the value of enabling Deaf individuals and their allies to build their own tools, particularly in atypical situations where mainstream technologies fail to provide effective support.

## 2.4 Edge Cases and the Limits of Existing Literature

Although assistive technology research addresses many physical and sensory disabilities, few studies focus on Deaf open water swimmers. Most existing work supports DHH swimmers in indoor competitive settings [19, 42], emphasizing performance rather than the relational, context specific communication needs of Deaf individuals. Open water environments introduce unique challenges that make common Deaf strategies, like visual signaling, difficult to apply [13]. This gap emphasizes the importance of documenting cases involving Deaf swimmers and their hearing allies, which reveal not only technical limitations but also new ways of understanding support, trust, and safety in activity based communication. The experience we present contributes to this space by showing how a Deaf open water swimmer and their hearing ally navigated communication challenges through small scale, situated, and relationally grounded solutions.

# 3 Methodology and Context

## 3.1 Positionality

Huffman is a Deaf swimmer and computer science doctoral student with profound bilateral sensorineural hearing loss (125–8000 Hz)[2]. They use American Sign Language (ASL) and written English and Chinese.

P1 is a hearing software engineer and fluent ASL user with a close personal relationship to Huffman. During swims, P1 provides kayaking support and co-developed the system.

Angelini is a Deaf predoctoral HCI researcher focused on Deaf Technology. He uses multiple signed and written languages, including German Sign Language (DGS), Austrian Sign Language (ÖGS), Spanish Sign Language (LSE), International Sign (IS), German, and English. He contributed critical reflection grounded in lived experience.

Kushalnagar is a Deaf researcher and Huffman's mentor and supervisor. He uses ASL and written English. Spiel is a hearing HCI researcher and Angelini's advisor. They are fluent in English and German, with intermediate ÖGS and basic IS. Both mentored this paper.

## 3.2 Situating the Design Need and Identifying Gaps

Unlike hearing swimmers, who receive instructions verbally or through marine whistles [10], Huffman relies solely on visual cues. Although they can communicate in ASL, it requires the swimmer to locate and face the kayak, which is not always feasible in open water. During training, Huffman typically glances toward the kayaker once every four to six strokes, approximately every 10 to 15 seconds. In urgent situations, such as warning about a nearby electric boat or making a course correction, standard Deaf attention strategies like flashing lights or floor stomps [26] are not applicable in water.

Huffman and P1 explored existing technologies to solve this problem. Similar needs have been partially addressed in the scuba diving community, where divers must communicate without sound. Products like the *Buddy-Watcher* [34] previously attempted to fill this role, but are no longer available, and it is unclear whether they worked reliably when one user was not submerged. Other affordable options now used in scuba contexts still rely on sound—either mechanical, electronic [43], or air-tank based [1]. After exploring these technologies and finding nothing suitable [12, 13], the pair realized they were facing a rare and safety-critical situation that mainstream accessibility technologies had not considered.

## 3.3 Collaborative Design Process

Drawing on their shared background in software engineering and their respective experiences as swimmer and kayaker, Huffman and P1 began exploring technical solutions to support open-water communication. To avoid adding cognitive or physical burden, they

[2]This range includes most speech and everyday sounds [25]. Profound loss across it indicates an inability to perceive sound from a medical perspective.

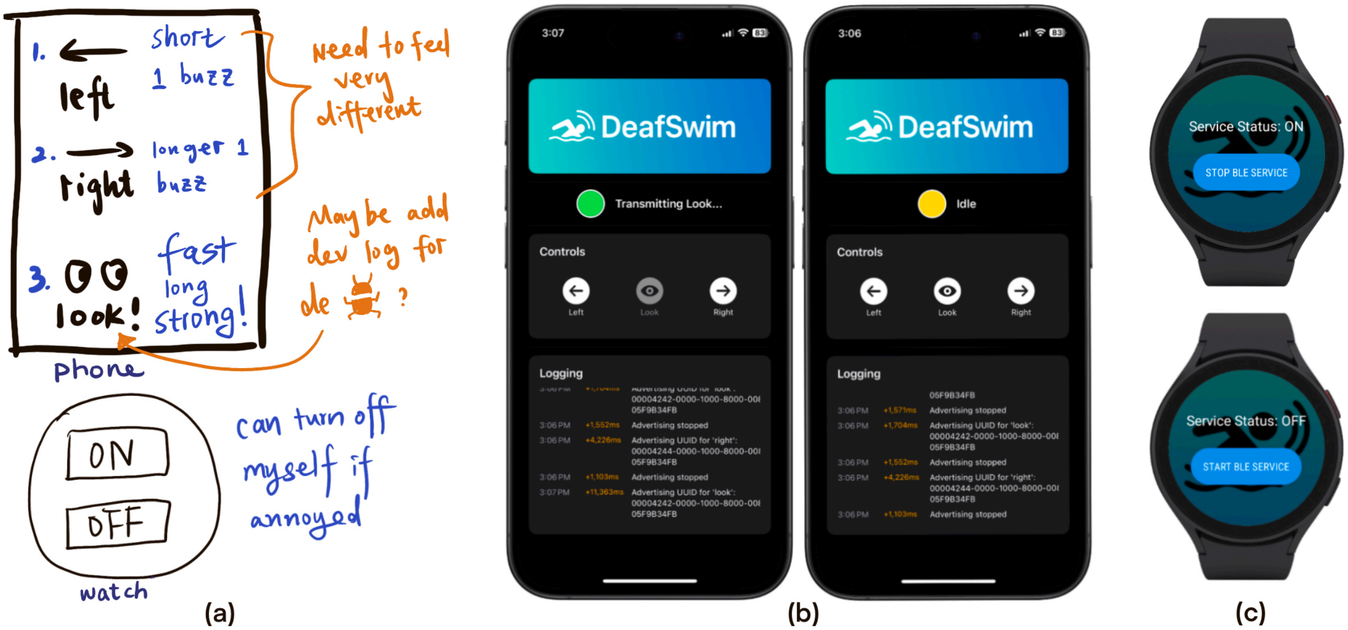


**Figure 2: Illustrations of the DeafSwim app. (a) One of Huffman's early sketches of the phone and watch interfaces. (b) Screenshots of the phone interface. (c) Screenshots of the watch interface.**

chose Huffman's existing waterproof smartwatch, already worn during workouts. Its built-in vibration feature offered a promising communication channel, especially given the visual unpredictability of aquatic environments.

Instead of building a complex system, they focused on a simple alert, similar to flashing lights or floor vibrations, to signal that the kayaker was trying to get the swimmer's attention. They created a one-way setup in which P1 could trigger watch vibrations using a smartphone. They defined three buzz patterns: left, right (for course correction), and look (for immediate attention) (Fig. 2 (a)). Huffman would respond by adjusting direction or making visual contact; ASL could follow as needed. The design relied on mutual trust and was reserved for moments of genuine need.

## 3.4 Apparatus and Tool Implementation

Huffman and P1 developed the system using devices they already owned and regularly used: an *iPhone 12 Pro* and a *Pixel Watch 3*. These devices communicate via Bluetooth Low Energy (BLE), with the iPhone advertising itself as a peripheral (Fig. 2 (b)) and the Pixel Watch listening for the advertisements and decoding embedded commands. (Fig. 2 (c)).

Several hardware and software implementation approaches were explored. Initial attempts using an Apple Watch proved unreliable, and the closed nature of the system prevented the developers from disabling power-saving features that interfered with the tool's functionality. In contrast, the Pixel Watch supported more stable BLE communication during testing, even when performing a persistent bidirectional BLE connection between the devices, and offered a more flexible development process. Due to the strong attenuation of Bluetooth signals by saltwater, the primary limitation was signal loss when the swimmer's arm re-entered the water after a stroke. This small window led them to use the advertisement data for one-way transmission. Furthermore, unlike the Apple Watch, Android's open architecture allowed them to modify the operating system directly and disable restrictive power-saving features. This was done by creating and installing a Magisk module [55] that, upon boot, runs Frida [41] and injects a script into the system Bluetooth daemon to modify its behavior. These modifications ultimately allowed the phone to reliably signal the watch within the brief transmission window between strokes.

The final system (Fig. 2 (b) and (c)), developed through iterative prototyping and testing, uses widely available commodity computing peripherals and is lightweight, reliable, effective, and tailored to a specific use case.

## 3.5 Reflective Practice and In-Use Insights

The tool was initially created by Huffman and P1 to meet their own needs. Early documentation was informal, including sketches, journal entries, memory, and comments in code. As the system became more reliable, they began reflecting more intentionally on the design and use. They completed six swim sessions in varied environments, including indoor pools, freshwater lakes, and coastal saltwater. The tool was refined across these sessions, and Huffman and P1 jointly discussed their design decisions and experiences. In parallel, Huffman and Angelini engaged in post-hoc reflection through journaling, dialogue, and memo writing. These reflections were grounded in embodied experience and shaped the framing of this paper, drawing on reflective approaches in HCI [21, 46].

## 4 Results and Discussion

We reflect on values emerging from accessibility research in HCI, including Deaf Tech design philosophy and situated empowerment. The following sections examine this case through Huffman's reflections, alongside Deaf cultural values and relational communication, and extend a broader call to support community-led technology making.

### 4.1 Defining Success Through Lived Experience

While the tool's reliability was evaluated through standard engineering practices, its user experience was assessed entirely through Huffman's reflection. Overall, the app worked well for Huffman, and they reported that they would use it every time they swim in open water with a kayaker.

For Huffman, success was not just about technical safety or athletic performance, but also about personal freedom and joy during those activities. The tool reduced the mental burden of constant sighting and made space for enjoyment. In their journal, they wrote: *"I saw a purple crab under a rock in Alki. I was fascinated because I had never seen a purple crab before, so I was watching it until I passed it."*—something they normally would *not* have done for *fear of missing important signals.* They further noted that the tool reduced their mental stress during swims especially when sunlight or environmental conditions made it difficult to maintain visual contact.

Ultimately, the tool succeeded by relieving an invisible workload that Huffman had long accepted. As they reflected: *"I was always thinking, 'What if they need my attention but I wasn't looking at them?'"* With the app in place, they described the experience as less stressful, making open water swimming more enjoyable in a way that had not been possible for this Deaf swimmer before. Later, Huffman reflected: *"I often felt open water swim is such a lonely sport. I used to think it is like death, because no one can reach me. But now knowing that someone can actually reach me, it feels so much less lonely, but also more independent."* Reflecting on this shift, Huffman wondered whether this newfound safety and presence was what hearing swimmers routinely experience when accompanied by a kayaker.

### 4.2 Reversing the Burden of Communication

After two swims with the system, Huffman wrote: *"I realized how much responsibility I was taking by having to look at the kayaker constantly. I had to sight myself inside and outside the water and also constantly look for the kayaker."* This meant checking for visual cues every few strokes, dividing attention between swimming and safety.

In many everyday situations, the Deaf or disabled person is expected to carry the burden of communication. Huffman wrote: *"We are always expected to do more work to make communication happen. Hearing people often ask us if we can read lips. Many of us have to go through speech therapy to adapt to the hearing norms."* This burden is not only social—it is often encoded into assistive technologies themselves, which require deaf users to wear extra devices or exert extra effort [20].

In contrast, this system intentionally shifts the responsibility to the hearing person. P1 monitors the environment, decides when to signal, and initiates interaction. Huffman is freed from constant visual monitoring and isn't asked to wear anything beyond their usual gear. The design repositions communication from Deaf users' constant vigilance to a model grounded in Deaf-centered values. Rather than requiring Huffman to compensate for hearing-centered norms, it supports shared experience and mutual responsibility.

### 4.3 Deaf-Hearing Collaboration in Relational and Situated Design

This system was developed through a Deaf-centered collaboration between Huffman and P1. As P1 reflected: *"We are doing this for 'us.' We are making it for 'our' needs."*—not *for the Deaf person*, nor to fix auditory deficits. During the design process, disagreements were often resolved by deferring to Deaf cultural values and communication norms. For example, Huffman labeled the three buttons as "left," "right," and "look." P1 initially suggested "stop" instead of "look" for consistency, but Huffman explained that the goal was to get the swimmer's attention, not to halt movement. P1 then agreed that "look" better reflected Deaf experiences and communication strategies.

In this case, P1 viewed themselves as an ally, not a savior. Huffman was a co-creator, not a passive recipient of care. Together, two friends crafted communication strategies grounded in respect and shared responsibility, responding to a situation where mainstream technologies had fallen short. This mindset stands in contrast to patterns in accessibility research where hearing researchers often dominate the process, and Deaf collaborators are involved only in limited feedback sessions [3, 37]. As Desai et al. argued, the absence of Deaf stakeholders in design not only introduces systematic bias [16], but also overlooks the deep expertise rooted in lived experience. Centering Deaf perspectives is not a bonus or final step, but is foundational to building technologies that are contextually grounded and culturally resonant.

### 4.4 Design Grounded in Deaf Embodied Experience

From the outset, Huffman and P1 aimed for a design that supported attentiveness without disruption. Vibrations were used only when necessary, directing attention through subtle haptic signals aligned with the swimmer's rhythm [27]. The system preserved mental focus, respected autonomy, and embodied a quiet form of care [17]. The communication model was intentionally asymmetrical, with only P1 sending signals. This reflected role-specific responsibility and was shaped by consent and clarity [51].

The design was refined through multiple rounds of testing, guided by Huffman's embodied experience. For example, swim environments ranged from cold saltwater in Puget Sound [44] to warmer freshwater lakes [32]. Colder conditions required stronger vibrations due to numbness, while warmer settings allowed for lighter feedback. Vibration strength and pattern were adjusted to suit each context. Rather than adapting tools focused on auditory deficits, the design centered Deaf individuals' everyday experiences, including embodied attention, preservation of the visual field, and context-aware alerting. Deaf individuals draw on spatial, visual, and haptic awareness in addition to multimodal communication strategies. Yet, accessibility design still frames Deafness primarily as hearing loss, overlooking this broader embodied expertise [2].

Deaf Tech offers an alternative: one that centers Deaf embodiment without relying on auditory norms [5]. When design engages with lived, contextual Deaf realities, it becomes more responsive and situated, and attuned to human experience. We encourage the accessibility research community to move beyond focusing solely on auditory access or sign language alone, and to embrace the full complexity of Deaf ways of being.

### 4.5 Call to Action

In this case, Huffman and P1 were able to create a solution because they had the technical knowledge and skills to do so. Many DHH individuals and communities, however, do not have the same access to design tools or development resources. This raises a broader question: **What happens to vital ideas when the very people who generate and need them most are not equipped to act on them?**

We offer this as a call to action for the ASSETS community: How might we build *Deaf-centered* research approaches and design ecosystems that empower DHH individuals to create technologies rooted in their lives? These tools may not be cutting-edge in a technical sense, but they can be culturally grounded, socially meaningful, and exquisitely situated. Their value lies not in novelty or scale, but in contextual fit, respect, and resonance.

We - hence - challenge the accessibility research community to rethink what counts as innovation in assistive technology. Rather than prioritizing scalability, technical complexity, or generalized utility, we must recognize and support *situated empowerment*: the ability for people to lead the design of technologies that reflect their own contexts, knowledge, cultures, and needs.

## 5 Conclusion

We presented a real-world case in which a Deaf swimmer and their hearing kayak partner developed a vibration based system to support communication during open water swims. The tool was not built for general use, but it addressed a critical gap in a specific context where conventional solutions did not work. Grounded in trust, cultural understanding, and physical awareness, this Deaf-lead system shows how deeply embodied and situated knowledge can lead to meaningful technology design. Rather than measuring performance or productivity, it centers lived experience and shared joy.

We argue that accessibility research should not stop at designing *for* DHH users, but must also support tools created *with and by* the DHH community. These tools may be small in scale and personal in scope, but they embody epistemological knowledge often invisible to design practices that reduce access technology to mere functionality. As we imagine more inclusive futures, we ask the ASSETS community: **What would a Deaf-centered maker movement look like? What tools and platforms are needed so Deaf people can create their own technological solutions, not only to access the world, but to shape it?**

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## References

[1] Amazon.com. n.d.. *Banger Underwater Signal Cylinder for Divers - Scuba Diving Accessories*. Amazon. https://www.amazon.com/Banger-Underwater-Signal-Cylinder-Accessories/dp/B0BP24RGQD Product page.

[2] Robin Angelini. 2024. *Deaf Tech Worth Wanting: A Participatory Speculative Investigation*. Ph. D. Dissertation. Technische Universität Wien.

[3] Robin Angelini, Katta Spiel, and Maartje De Meulder. 2024. Bridging the Gap: Understanding the Intersection of Deaf and Technical Perspectives on Signing Avatars. In *Sign Language Machine Translation*. Springer, 291–308.

[4] Robin Angelini, Katta Spiel, and Maartje De Meulder. 2024. Experiencing Deaf Tech: A Deep Dive into the Concept of DeafWatch. In *Proceedings of the 26th International ACM SIGACCESS Conference on Computers and Accessibility*. 1–4.

[5] Robin Angelini, Katta Spiel, and Maartje De Meulder. 2025. Speculating Deaf Tech: Reimagining Technologies Centering Deaf People. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems*. 1–18.

[6] Mark S Baldwin, Sen H Hirano, Jennifer Mankoff, and Gillian R Hayes. 2019. Design in the public square: Supporting assistive technology design through public mixed-ability cooperation. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (2019), 1–22.

[7] Yael Bat-Chava. 2000. Diversity of deaf identities. *American annals of the deaf* (2000), 420–428.

[8] H-Dirksen L Bauman. 2004. Audism: Exploring the metaphysics of oppression. *Journal of deaf studies and deaf education* 9, 2 (2004), 239–246.

[9] H-Dirksen L Bauman and Joseph J Murray. 2014. *Deaf gain: Raising the stakes for human diversity*. U of Minnesota Press.

[10] Beatrice Black. 2023. *Feel Good About Open Water Swimming*. USA Triathlon. https://www.usatriathlon.org/articles/training-tips/feel-good-about-open-water-swimming Accessed: 2025-05-03.

[11] Leah Buechley, Daniela K Rosner, Eric Paulos, and Amanda Williams. 2009. DIY for CHI: methods, communities, and values of reuse and customization. In *CHI'09 Extended Abstracts on Human Factors in Computing Systems*. Association for Computing Machinery, New York, NY, USA, 4823–4826. doi:10.1145/1520340.1520750

[12] ScubaBoard Community. 2004. *Dive Computer for Deaf Diver*. ScubaBoard. https://scubaboard.com/community/threads/dive-computer-for-deaf-diver.77997/ Forum post.

[13] ScubaBoard Community. 2023. *Signal Device for Hard of Hearing Divers*. ScubaBoard. https://scubaboard.com/community/threads/signal-device-for-hard-of-hearing-divers.629069/ Forum post.

[14] Sasha Costanza-Chock. 2020. *Design justice: Community-led practices to build the worlds we need*. The MIT Press.

[15] Jesper Dammeyer, Christine Lehane, and Marc Marschark. 2017. Use of technological aids and interpretation services among children and adults with hearing loss. *International journal of audiology* 56, 10 (2017), 740–748.

[16] Aashaka Desai, Maartje De Meulder, Julie A Hochgesang, Annemarie Kocab, and Alex X Lu. 2024. Systemic biases in sign language AI research: A deaf-led call to reevaluate research agendas. *arXiv preprint arXiv:2403.02563* (2024).

[17] Paul Dourish. 1999. Embodied interaction: Exploring the foundations of a new approach to HCI. *Work* 1, 1 (1999), 1–16.

[18] Claire Edwards and Gill Harold. 2014. DeafSpace and the principles of universal design. *Disability and Rehabilitation* 36, 16 (2014), 1350–1359.

[19] Don Samitha Elvitigala, Daniel Wessolek, Attila Victor Achenbach, Chanaka Singhabahu, and Suranga Nanayakkara. 2016. SwimSight: Supporting deaf users to participate in swimming games. In *Proceedings of the 28th Australian Conference on Computer-Human Interaction*. 567–570.

[20] Lance Forshay, Kristi Winter, and Emily M. Bender. 2016. An Open Letter Regarding “SignAloud: A Glove That Translates American Sign Language to Speech”. https://faculty.washington.edu/ebender/papers/SignAloudOpenLetter.pdf

[21] Christopher Frauenberger, Marjo Rauhala, and Geraldine Fitzpatrick. 2017. In-action ethics. *Interacting with computers* 29, 2 (2017), 220–236.

[22] Aimi Hamraie. 2017. *Building access: Universal design and the politics of disability*. U of Minnesota Press.

[23] Aimi Hamraie, Kelly Fritsch, Gabriele Stera, Lucie Camous, Lucas Fritz, and Chosson Etienne. 2025. Crip technoscience manifesto. (2025).

[24] HandSpeak. n.d.. *Hearing allyship with Deaf community*. HandSpeak. https://www.handspeak.com/learn/230/ Accessed: 2025-05-03.

[25] Hearing Aid HealthCare. 2015. *How to Read an Audiogram & Understanding Your Hearing Test*. Hearing Aid HealthCare. https://www.hahc.net/hearing-loss-articles/read-audiogram-hearing-test/ Accessed: 2025-05-03.

[26] Speech & Deaf Center Hearing. n.d.. *Deaf 101*. HSDC. https://hsdc.org/services/deaf-101/ Accessed: 2025-05-03.

[27] Sarah Homewood, Marika Hedemyr, Maja Fagerberg Ranten, and Susan Kozel. 2021. Tracing conceptions of the body in HCI: From user to more-than-human. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–12.

[28] Amy Hurst and Jasmine Tobias. 2011. Empowering individuals with do-it-yourself assistive technology. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. 11–18.

[29] Dhruv Jain, Audrey Desjardins, Leah Findlater, and Jon E Froehlich. 2019. Autoethnography of a hard of hearing traveler. In *Proceedings of the 21st International ACM SIGACCESS Conference on Computers and Accessibility*. 236–248.

[30] Paddy Ladd. 2003. *Understanding deaf culture: In search of deafhood*. Multilingual Matters.

[31] Paddy Ladd. 2005. Deafhood: A concept stressing possibilities, not deficits. *Scandinavian Journal of Public Health* 33, 66_suppl (2005), 12–17.

[32] LakeMonster. n.d.. *Lake Sammamish, WA*. LakeMonster. https://lakemonster.com/lake/WA/Lake-Sammamish-485 Accessed: 2025-05-03.

[33] Qisheng Li and Shaomei Wu. 2024. Towards Fair and Inclusive Speech Recognition for Stuttering: Community-led Chinese Stuttered Speech Dataset Creation and Benchmarking. In *Extended Abstracts of the CHI Conference on Human Factors in Computing Systems*. 1–9.

[34] Scuba Diver Life. n.d.. *Gear Review: Buddy Watcher*. Scuba Diver Life. https://scubadiverlife.com/gear/gear-review-buddy-watcher/ Accessed: 2025-05-03.

[35] Michella Maiorana-Basas and Claudia M Pagliaro. 2014. Technology use among adults who are deaf and hard of hearing: A national survey. *Journal of deaf studies and deaf education* (2014), 400–410.

[36] Jennifer Mankoff, Gillian R Hayes, and Devva Kasnitz. 2010. Disability studies as a source of critical inquiry for the field of assistive technology. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. 3–10.

[37] Emma J McDonnell and Leah Findlater. 2024. Envisioning Collective Communication Access: A Theoretically-Grounded Review of Captioning Literature from 2013-2023. In *Proceedings of the 26th International ACM SIGACCESS Conference on Computers and Accessibility*. 1–18.

[38] Carol A Padden and Tom L Humphries. 1988. *Deaf in America: Voices from a culture*. Harvard University Press.

[39] Ila Parasnis. 1998. *Cultural and language diversity and the deaf experience*. Cambridge University Press.

[40] Mary R Power, Des Power, and Louise Horstmanshof. 2007. Deaf people communicating via SMS, TTY, relay service, fax, and computers in Australia. *Journal of deaf studies and deaf education* 12, 1 (2007), 80–92.

[41] Ole André V. Ravnås. n.d.. *Frida: Dynamic Instrumentation Toolkit*. Frida. https://frida.re/

[42] Diana Aurora Rubio Molina and María José Martínez Zapata. 2024. Enhancing Deaf Athletes’ Performance: Vibrating Wristband for Referee Whistle Detection on Recreational Sports Using Wi-Fi. *Journal of Biomimetics, Biomaterials and Biomedical Engineering* 66 (2024), 27–35.

[43] ScubaToys. n.d.. *DiveAlert Plus V2 Air Horn*. ScubaToys. https://www.scubatoys.com/products/1318-dive-alert-plus-v2-air-horn/ Product page.

[44] SeaTemperature.info. n.d.. *Alki Beach Water Temperature (WA) & Surf Forecast*. SeaTemperature.info. https://seatemperature.info/alki-beach-water-temperature.html Accessed: 2025-05-03.

[45] Matthew Seita, Sooyeon Lee, Sarah Andrew, Kristen Shinohara, and Matt Huenerfauth. 2022. Remotely co-designing features for communication applications using automatic captioning with deaf and hearing pairs. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems*. 1–13.

[46] Phoebe Sengers, Kirsten Boehner, Shay David, and Joseph’Jofish’ Kaye. 2005. Reflective design. In *Proceedings of the 4th decennial conference on Critical computing: between sense and sensibility*. 49–58.

[47] Tom Shakespeare. 1996. Disability, identity and difference. *Exploring the divide* (1996), 94–113.

[48] Per Koren Solvang and Hilde Haualand. 2014. Accessibility and diversity: Deaf space in action. *Scandinavian Journal of Disability Research* 16, 1 (2014), 1–13.

[49] Oliver Suchanek, Janis Lena Meissner, Robin Angelini, and Katta Spiel. 2025. From Participation to Solidarity: A Case Study on Access of Maker Spaces from Deaf and Hearing Perspectives. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems*. 1–15.

[50] Theresa Jean Tanenbaum, Amanda M Williams, Audrey Desjardins, and Karen Tanenbaum. 2013. Democratizing technology: pleasure, utility and expressiveness in DIY and maker practice. In *Proceedings of the SIGCHI conference on human factors in computing systems*. 2603–2612.

[51] Amy Voida, Stephen Voida, Saul Greenberg, and Helen Ai He. 2008. Asymmetry in media spaces. In *Proceedings of the 2008 ACM conference on Computer supported cooperative work*. 313–322.

[52] Anna Witter-Merithew. 1999. From benevolent care-taker to ally: The evolving role of sign language interpreters in the United States of America. *Gebärdensprachdolmetschen: Dokumentation der Magdeburger Fachtagung* (1999), 55–64.

[53] Jacob O Wobbrock, Shaun K Kane, Krzysztof Z Gajos, Susumu Harada, and Jon Froehlich. 2011. Ability-based design: Concept, principles and examples. *ACM Transactions on Accessible Computing (TACCESS)* 3, 3 (2011), 1–27.

[54] Di Wu. 2021. Cripping the History of Computing. *IEEE Annals of the History of Computing* 43, 3 (2021), 68–72. doi:10.1109/MAHC.2021.3101061

[55] John Wu. n.d.. *Magisk Guides*. Magisk. https://topjohnwu.github.io/Magisk/guides.html