A "beyond being there" approach to social augmentation in XR/VR

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Abstract

Here we briefly illustrate how our collaborative team has leveraged Research through Design (RtD) prototyping along with technology-probe evaluation methods to explore a "beyond being there" approach to social augmentation in VR/XR. Designing specifically for the context of workplace collaboration in virtual meetings, our research and prototyping exploration has identified novel opportunities for supporting emergent social capacities otherwise unavailable in so-called "meat space."

Keywords

social augmentation, virtual reality, social VR, VR meetings, communication affordances, emerging design practices, extended reality

1. Introduction

Since 2018, our collaborative team has been researching and prototyping opportunities for augmenting social interaction in ways that go beyond what is possible in face-to-face encounters. The work initially began with a postdoc funded by Mozilla, and later was funded by the National Science Foundation, as a collaboration between research teams at the University of California Santa Cruz (PI Isbister) and San Francisco State University (PI McVeigh-Schultz).

Our methodological and theoretical approach here can be understood as an update of Hollan and Stornetta's "beyond being there" [14] for XR media. In our own writing on the topic, we have developed this position as a rallying cry for researchers and designers to more creatively envision the future of social interaction in XR [25,26]. We feel this work is directly relevant to the workshop's theme of social augmentation in XR that goes beyond mirroring real-world communication. In addition, we are excited to consider the ways that social augmentation in XR can push us to also think beyond the enhancement of existing social and emotional cues to, rather, surface new kinds of cues, new social coordination or signalling capacities that might not be as familiar given the "wet-wear" limitations of our embodied experiences in physical space.

Our research in this area has taken two parallel paths: (1) qualitative research focused on identifying novel social affordances from the emerging design ecology of social interaction in VR and XR [3,7,9,11] and (2) Research-through-Design (RtD) explorations of novel social signaling mechanics in VR [1,1,4,10]. Using this two-pronged approach, we have developed a range of VR prototypes that embed novel social cues and feedback into the virtual environment (and onto the augmented body), with particular emphasis on "beyond being there" affordances that would not be possible in the physical world [9,15,19,20]. We have also published on our innovations in embodied design methods for XR prototyping to support this RtD work [13].

As an example of our RtD approach to building prototypes, our extended team has built out a social augmentation toolkit (Figure 1), which we evaluated through a technology probe study (led by co-author, Anya Osborne). To see more detailed documentation of this work, please see [10,12] or visit our project site at https://socialsuperpowers.net/.

To inform our prototyping practice, at various points, we have also conducted qualitative landscape research on a range of commercial XR products, including social VR applications (circa 2018) [3,7,9] and

CHI 2026: Workshop position paper for 'Shaping Future Human Connection: Social Augmentation through XR Technologies.'

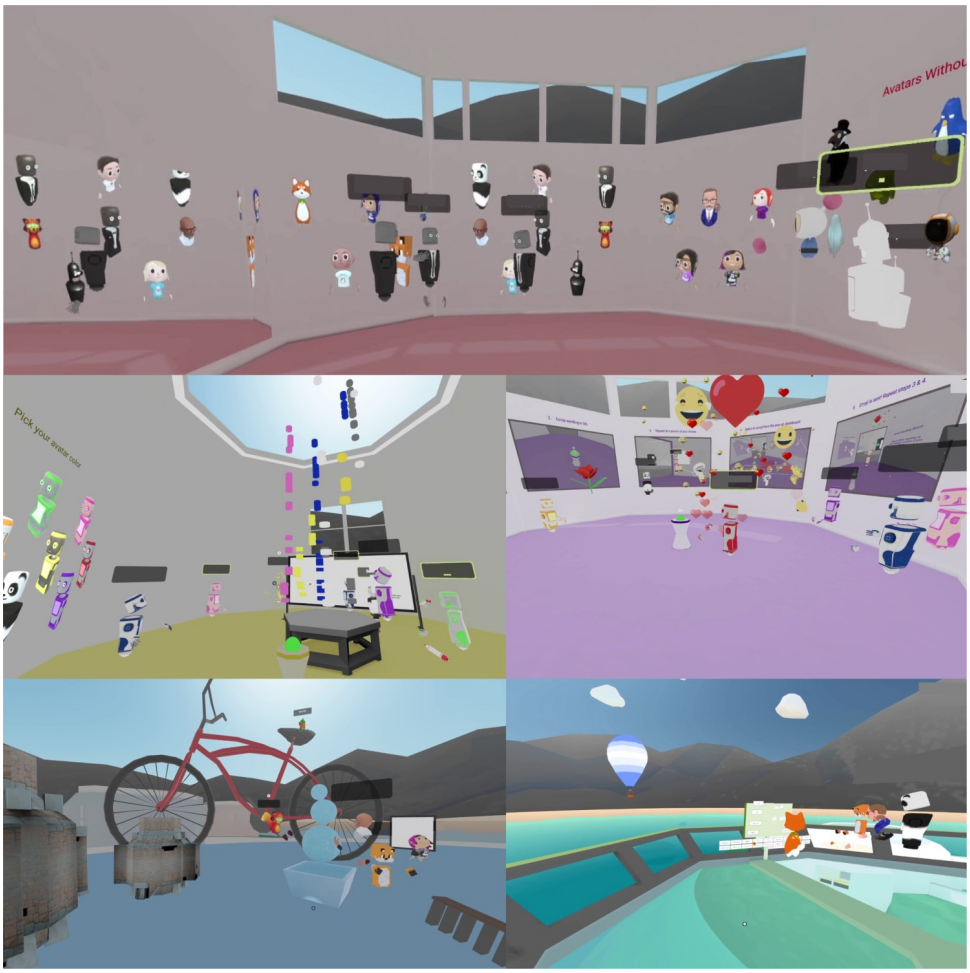

Figure 1: A social augmentation toolkit for VR meetings was built as a custom adaptation of the Mozilla Hubs code base. Five evaluated prototypes were: (1) an avatar changing room to support on-the-fly expressive alignment with meeting goals (ex: shifting from productive to creative avatars during a brainstorm) (top), (2) a live conversation visualization to support balancing of participants' cumulative speech-time (middle left), (3) a directional emoji sending/showering feature to improve affective communication beyond standard VR/XR emojis (middle right), (4) a modular space making kit that enabled participants to redesign their meeting environment on the fly (bottom left), and (5) a flying meeting platform that moved through space as a way of marking the passage of time (bottom right). For more detail, see [10,12].

VR meeting support software (circa 2022) [11] to understand what sorts of design choices are worth drawing lessons from and where there are important gaps to address.

1.1. Challenges of evaluation

Evaluating these sorts of nascent or inchoate opportunities can be challenging in the context of HCI research, where reviewers and other audiences can sometimes underappreciate the crucial role that early and intermediate prototyping can play during formative engagement with target users [14]. Adding to this challenge, target users for emerging media forms tend to have uneven familiarity—not only with the technology itself, but also—with emerging social configurations and protocols that a novel technological opportunity presents. This poses unique challenges for evaluating mid-fidelity prototypes that aim for a more transformative impact on social interaction. Those more comfortable with traditional HCI evaluation approaches might expect user testers to be introduced to the social protocol or ritual first, in preparation for the evaluation. But in formative situations [14], the ritual or protocol, itself, may not yet be codified (it is, itself, an up-for-grabs emergent phenomena deeply entangled with the prototyping process).

In order to explore the social opportunities of novel affordances through prototyping evaluation, then, we need target users who, not only understand the technology enough to gracefully accommodate the challenges of working with mid-fidelity prototypes, but can also, bring deep intuitions and creativity about how new social rituals/routines/protocols might be opened up by new interactive capabilities. Here, it's worth acknowledging the relevance of William Gibson's often-repeated perspective about the future being "already here, just unevenly distributed." In our evaluation, we sought out target users whose emergent social practices signaled possible futures—local maxima in Gibson's vision of uneven distribution.

1.2. The value of 'technology probe' studies for RtD prototype evaluation

With this approach in mind, we developed a 'technology probes' study [2] led by coauthor Anya Osborne that engaged with: creators of social VR meeting applications, professional content creators for VR/XR platforms, and educators who regularly conducted academic activities using these platforms. These engagements involved two phases, with Phase 1, comprising a series of workshops we ran with five professional teams (N = 28) introducing them to our social augmentation toolkit. Subsequently, each team conducted their own meetings using our toolkit on their own, with a total of 40 individuals who left feedback and completed post-study surveys.

While a more detailed description of the evaluation methodology is not possible here, for more detail, we encourage the reader to review co-author Anya Obsorne's dissertation and recent publication [10,12].

2. Key takeaways from the technology probe study

We are finalizing a summative report on the technology probe study to be published at a future date, but what can be acknowledged here are the following high level takeaways:

1. Participants in our technology probe study readily took up the non-skeuomorphic feature set of our toolkit. Below we include brief summaries of a selection of tools and share illustrative quotes from technology probe participants remarking on their experiences.
2. In general, the social augmentation tools we presented did not prevent participants from engaging in serious work. Participants saw potential for the tools to support their collaborative virtual work.
3. Tools that enjoyed the most enthusiastic reception included three specific feature sets (i) a 'conversation visualization' that enabled participants to see a shared real-time visualization of who was talking more or less, (ii) a 'space making' kit that enabled participants to create modular environments for holding virtual meetings, and (iii) a flying platform that moved between visual landmarks during a meeting period, enabling participants to track the passage of time through ambient awareness of movement through space.

Below we add a bit more detail about the three tools/features noted above as most enthusiastically received by our technology probe participants.

2.1. Conversation Visualization: Shared feedback for balancing speech among VR meeting participants

Part of our larger social augmentation toolkit, the conversation visualization tool (Figure 2) provides realtime feedback to VR meeting participants about their relative speech contributions.

Results from our technology probe study suggested that shared visual conversational feedback in VR could play a role in promoting active participation, managing group dynamics, and even aiding in recalling contextual information suggested by others during ongoing conversations. Several participants expressed an increased feeling of verbal self-awareness (i.e., awareness of their speech time in relation

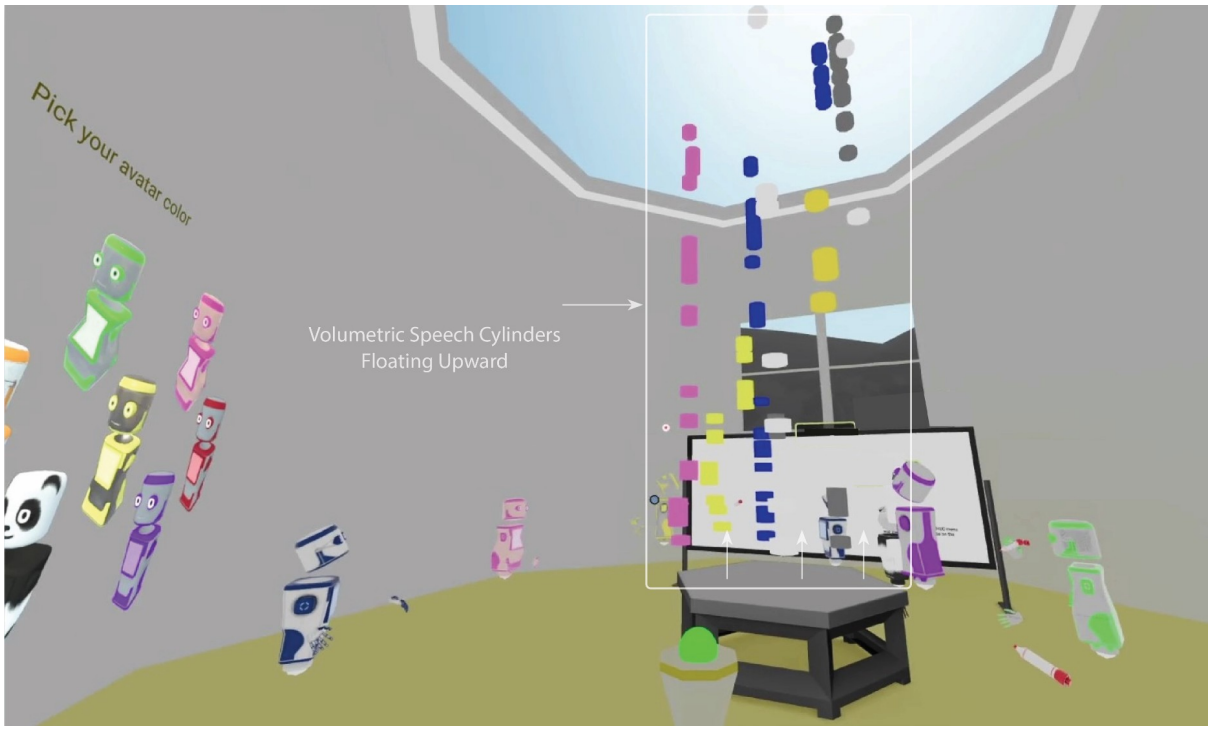

Figure 2: Conversational visualization in VR (to support awareness of who is talking more/less in meetings). Colored columns spawn corresponding to the avatar color of the respective speaker. These columns rise together over time and elongate while a participant is speaking. For more details see [10,12]. Also inspired by earlier iterations and exploration [1,5,8]. (Image reproduced from [12].)

to others) and speech empowerment, and this increased awareness was regarded as having a positive effect on participants' engagement in group discussions. One participant mentioned, "Personally, I have a hard time speaking up, and I didn't realize that I was doing it. So the visualization was kind of like a push for me to say something." Another participant stated, "I'm a person who tends to talk a lot, and to me, it wasn't as much of a self-conscious feeling, rather the feeling of awareness that I really appreciated about this concept."

Finally, participants broadly appreciated the unusual communication affordances offered by this tool, which would be difficult to reproduce in physical space. According to one social VR creator, "Most VR tools are attempting to recreate real life as much as possible, and this is the first time I've seen a feature to make it better than real life for augmenting a typical meeting or a conversation."

2.2. Environmental Modulation with the Space-making Kit

Another well received tool in our social augmentation toolkit was a modular space-making kit that enabled participants to redesign their meeting environment on the fly.

The space-making kit (Figure 3) showcases a series of modular virtual objects that can be recombined in various ways, enabling participants to redesign their meeting environment in an ad hoc way. Participants can grab objects, duplicate them, scale them up, and recombine them, to construct a unique meeting environment. Assets include environmental prefabs, specific meeting props (such as chairs), and more abstract objects (like boxes and other shapes) to group topics that arise during a meeting.

Results of the technology probe suggested that participants enjoyed using the tool as a collaborative opportunity to re-envision their meeting environment in playful ways, with emphasis on modular recombination (connecting shapes, like "legos") and particular interest in experimenting with scale. Several emphasized the surprise and enjoyment of scaling up the kit's virtual assets to become "giant objects." In some cases, these explorations, and the conversation that accompanied them, seemed to serve as an ice-breaker activity. Moreover, these co-designed meeting environments became opportunities for

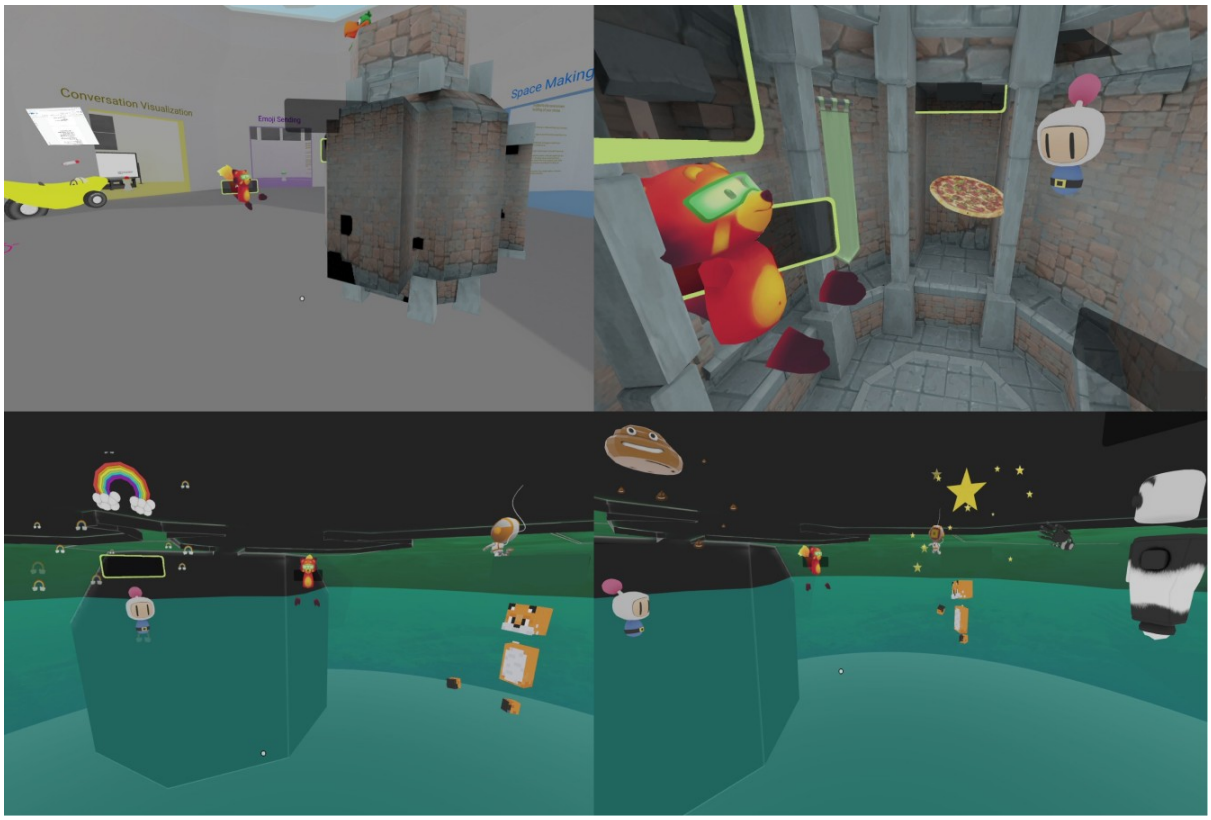

Figure 3: Participants interacting with the space-making kit, a modular tool for designing a custom virtual meeting environment.

experimenting with the relationship between bodies and the built environment, with one participant (depicted in Figure 3) remarking: "We got inside and under the space-making kit."

It should be acknowledged that, while the tool's perceived design merit was recognized for its potential to foster creativity and collaboration in VR meetings, those perceptions were tempered by participants' frustrations with the Mozilla Hubs' technical limitations for manipulating objects in the environment.

2.3. Flying Platform to Help Manage Time in VR Meetings

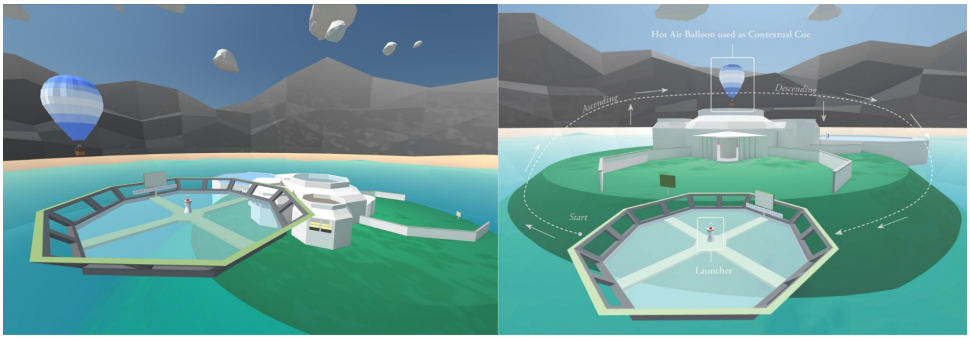

Figure 4: A flying meeting platform to help participants keep track of time through ambient awareness of shared movement through space.

The flying meeting platform was another prototype that garnered interest from participants in the technology probe study. When meeting participants launch the platform, they move together ascending over the architecture and environment below. Participants' ambient awareness of movement in space as

they traverse space and approach prominent visual landmarks (like a hot air balloon) helped participants to keep track of time in a non-intrusive way. As one participant noted, "I like the idea of a background timer that's not distracting [...] to keep everything on track."

3. Conclusions

Our work here points to promising opportunities to design social augmentations that take advantage of the unique affordances of VR by turning environmental and embodied features into visualizations of social data. Beyond replication of real-world props, this work aims to leverage novel embodied capacities that unlock new social affordances—or what we have come to think of as "social superpowers"—in VR [5,6]. Along these lines, we identify areas where social cues can be heightened in ways not typically possible in the physical world. These include: (1) social data visualization as a living feature of the environment, (2) alternative social geometries that expand our sense of embodied relationships in space, and (3) new forms of embodied communication that facilitate unfamiliar social rituals (see [5]).

4. Acknowledgements

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Declaration on Generative AI

The author(s) have not employed any Generative AI tools in the preparation of this work.

References

[1] Sean Fernandes. 2020. Supporting Collaboration in Social VR. University of California Santa Cruz, California.

[2] Hilary Hutchinson, Wendy Mackay, Bo Westerlund, Benjamin B. Bederson, Allison Druin, Catherine Plaisant, Michel Beaudouin-Lafon, Stéphane Conversy, Helen Evans, Heiko Hansen, Nicolas Roussel, and Björn Eiderbäck. 2003. Technology probes: inspiring design for and with families. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 17–24. https://doi.org/10.1145/642611.642616

[3] Anya Kolesnichenko, Joshua McVeigh-Schultz, and Katherine Isbister. 2019. Understanding Emerging Design Practices for Avatar Systems in the Commercial Social VR Ecology. In *Proceedings of the 2019 on Designing Interactive Systems Conference*, 241–252. https://doi.org/10.1145/3322276.3322352

[4] Jialang Victor Li, Max Kreminski, Sean M Fernandes, Anya Osborne, Joshua McVeigh-Schultz, and Katherine Isbister. 2022. Conversation Balance: A Shared VR Visualization to Support Turn-taking in Meetings. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts*, 1–4. https://doi.org/10.1145/3491101.3519879

[5] Joshua McVeigh-Schultz and Katherine Isbister. 2021. The Case for "Weird Social" in VR/XR: A Vision of Social Superpowers Beyond Meatspace. In *Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems*, 1–10. https://doi.org/10.1145/3411763.3450377

[6] Joshua McVeigh-Schultz and Katherine Isbister. 2022. A "beyond being there" for VR meetings: envisioning the future of remote work. *Human–Computer Interaction* 37, 5: 433–453. https://doi.org/10.1080/07370024.2021.1994860

[7] Joshua McVeigh-Schultz, Anya Kolesnichenko, and Katherine Isbister. 2019. Shaping Pro-Social Interaction in VR: An Emerging Design Framework. In *2019 CHI Conference on Human Factors in Computing Systems Proceedings*.

[8] Joshua McVeigh-Schultz, Max Kreminski, Keshav Prasad, Perry Hoberman, and Scott S. Fisher. 2018. Immersive Design Fiction: Using VR to Prototype Speculative Interfaces and Interaction Rituals

within a Virtual Storyworld. In *Proceedings of the 2018 Designing Interactive Systems Conference*, 817–829. https://doi.org/10.1145/3196709.3196793

[9] Joshua McVeigh-Schultz, Elena Márquez Segura, Nick Merrill, and Katherine Isbister. 2018. What's It Mean to "Be Social" in VR?: Mapping the Social VR Design Ecology. In *Proceedings of the 2018 ACM Conference Companion Publication on Designing Interactive Systems*, 289–294. https://doi.org/10.1145/3197391.3205451

[10] Anya Osborne. 2024. "Design of Social Affordances for Meetings in Social Virtual Reality." PhD Dissertation, Santa Cruz, CA, USA: University of California Santa Cruz. UCSC.

[11] Anya Osborne, Sabrina Fielder, Joshua Mcveigh-Schultz, Timothy Lang, Max Kreminski, George Butler, Jialang Victor Li, Diana R. Sanchez, and Katherine Isbister. 2023. Being Social in VR Meetings: A Landscape Analysis of Current Tools. In *Proceedings of the 2023 ACM Designing Interactive Systems Conference*, 1789–1809. https://doi.org/10.1145/3563657.3595959

[12] Anya Osborne, Joshua McVeigh-Schultz, Alexandra Leeds, George Butler, Samir Ghosh, and Katherine Isbister. 2025. "Let's Jump into More Creative Avatars and Take this Brainstorm to the Flying Platform:" Playful Prototypes of VR Meeting Support Tools. In *Proceedings of the 2025 ACM Designing Interactive Systems Conference*, 691–710. https://doi.org/10.1145/3715336.3735421

[13] Joshua McVeigh-Schultz, Elena Márquez Segura, and Katherine Isbister. 2024. Embodied prototyping in VR: Ideation and bodystorming within a custom VR sandbox. https://doi.org/10.21606/drs.2024.1193

[14] Raquel B Robinson, Anya Osborne, Chen Ji, James Collin Fey, Ella Dagan, and Katherine Isbister. 2024. "That's Not Good Science!": An Argument for the Thoughtful Use of Formative Situations in Research Through Design. In *Extended Abstracts of the CHI Conference on Human Factors in Computing Systems*, 1–8. https://doi.org/10.1145/3613905.3644063