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RESEARCH-ARTICLE

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Fig. 1. (a) The outdoors VE in Mentorship Garden. (b) A garden shelf and soil mound for mentorship rituals. (c) A meeting in Mentorship Garden. Faces and names are blurred for anonymity in all applicable figures.

Workplace mentorship is critical for career advancement, sense of belonging, and well-being. However, historically marginalized groups face barriers to effective mentorship including misaligned commitments, difficulty establishing comfort with mentors, and relationship persistence. We explore how 3D virtual environment (VE) counterspaces, or spaces that center the well-being of marginalized people, can circumnavigate these barriers and generate dedicated environments for workplace mentorship. We present Mentorship Garden: a digital counterspace designed to facilitate mentorship communication around commitments, goals, progress, and well-being. We deployed Mentorship Garden with 10 mentor-mentee pairs, recruited from DEI mentoring programs at a large global company, and interviewed them about their experiences. Overall, Mentorship Garden provided a relaxing space for participants to engage in rituals supporting historically marginalized

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individuals via mentorship, but revealed potential challenges in seamlessly integrating it in the workplace. We discuss design implications for creating virtual mentorship counterspaces in the workplace and opportunities for future research.

CCS Concepts: • **Human-centered computing** → **Interactive systems and tools**; *User studies*; **Computer supported cooperative work**.

Additional Key Words and Phrases: mentorship; counterspaces; 3D virtual environments; rituals; visual metaphors; workplace

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1 Introduction

Social connection and belonging in professional environments are critical to employee performance and retention [19, 69]. However, historically marginalized groups face major challenges to developing these feelings, including workplace incivility and microaggressions [119], which can negatively impact their well-being and lead to burnout [83]. Such toxic environments can lead to high turnover, contributing to what has been dubbed the “Great Resignation” in recent years [122].

One important intervention to address these challenges is to provide mentorship opportunities for historically marginalized groups in the workplace, such as through formal programs supported by workplace organizations. Workplace mentorship is an essential platform for learning, career development, and social support, that can lead to career advancement and subsequently greater diversity within leadership [60]. However, while mentorship programs can start new mentorship relationships, participants often face challenges building and maintaining these relationships [109]. Issues such as power imbalances, stigma and implicit biases, lack of consideration for identity and culture, misaligned values and more can affect the strength and persistence of mentorship relationships for marginalized people [48]. To address this, we propose a novel intervention to transform mentorship meetings into *counterspaces*, or “safe spaces” that exist at the margins of dominant culture and foster a sense of belonging, self-expression, and empowerment for marginalized individuals [93].

We present Mentorship Garden, a research prototype that provides a counterspace for mentorship in the workplace. Mentorship Garden is a desktop-based 3D virtual environment (VE) that enables mentor-mentee pairs to grow a virtual garden together. Pairs partake in virtual mentorship rituals that encourage them to establish goals together, discuss important mentorship topics, track progress, and express their identities. Mentorship Garden provides a persistent space for pairs to return to and make their own, along with a chat system for pairs to engage asynchronously, to encourage continuous engagement in their mentorship.

We deployed Mentorship Garden in a field study with 10 pairs of participants (N=20), who held two mentorship meetings with each other using the prototype (except Pair 9, due to availability barriers). Our results demonstrate that Mentorship Garden helped participants ground and build their relationship, as well as facilitated important conversations around mentorship and overall well-being. Mentorship Garden indeed became a counterspace for participants, who felt like they were transported to a comforting, playful alternate reality from work. As such, participants described the potential for such a counterspace to uplift marginalized individuals, such as by fostering a balance in power as well as identity expression. At the same time, participants described concerns around its adoption in a professional setting. Taken together, we contribute: 1) the design and evaluation of Mentorship Garden, a 3D VE for facilitating conversation-based mentorship through

a set of rituals, and 2) design implications and opportunities for future work to explore designing VE counterspaces that empower marginalized people in the workplace.

2 Related Work

2.1 DEI and Mentorship in the Workplace

Over the last few decades, researchers have explored several interventions to promote diversity and inclusion in the workplace. At the start of the workforce pipeline, CSCW researchers have synthesized a framework for designing support tools for socially and economically marginalized people seeking decent work [31]. Within the workplace, researchers have explored improving well-being through diversity training supporting LGBTQIA2S+ groups [99] and people with disabilities [101], as well as psychological belonging interventions for women and racial minorities in STEM [21].

Across diverse fields and identity groups, mentorship is perhaps one of the most implemented interventions in the workplace [3, 5, 7, 10, 20, 55, 60, 63, 76, 82, 117]. Mentorship is a support-based relationship in which people guide others through career advancement (e.g. sponsorship, apprenticeship) and psychosocial development (e.g. role modeling, counseling) [76, 89]. Mentorship can range from traditional senior-to-junior pairs, where a mentor provides guidance for people less experienced in their careers, to informal support groups between peers in laterally similar positions, where mentorship is multi-directional [89]. Mentors can provide social support, teach skills, and act as role models [76]. For marginalized individuals, mentorship can be a source of positive social and psychological capital (e.g., self-efficacy, hope, resilience) in the workplace [102]. Mentorship also supports the success of marginalized groups in the workplace by facilitating entry, professional transitions, and expertise development [9]. Intersectional mentoring can further help marginalized mentees, wherein reflexivity can uncover the intersecting ways that oppressive systems affect them, informing a mentorship with their well-being at the center [14]. Mentors who also function as sponsors, by leveraging their seniority and connections to advocate for marginalized mentees, can be key for career promotions [4, 89].

With the prominence of remote and distributed work, researchers in CSCW and broader HCI communities have explored how mentorship can transfer to the virtual context [49, 65]. Much CSCW and HCI work has found that remote technologies (online portals, video calls, etc.) that enable online mentorship facilitate access to career development, career advice, skills building, and employment opportunities [38, 56, 68, 81, 96, 107, 124]. Informal, supportive communication patterns (friendly language, using emoticons, showing interest in the mentee as a person, etc.) in online mentorships are especially effective [112]. Moreover, research shows how online mentorship can lower access barriers and nurture meaningful relationships across communities, including marginalized ones like older adults [134]. It can also enhance mentees' motivation and self-efficacy through positive representation, such as in the experiences of Black women mentoring Black girls during virtual computer science camps [10]. Further, research indicates peer mentorship online can be beneficial for self-worth, as seen in online communities for professional women [111]. Mentors can even engender belonging in hybrid teams with isolated remote members [65].

Despite the known benefits of mentorship, both online and offline, recent research suggests that while marginalized individuals may be able to access mentorship at work, they can have difficulty establishing and maintaining relationships with mentors. Beyond simply matching with someone who is more experienced, mentees value personality fit, where they need to establish a sense of connection and trust with the mentor [109]. Building a mentorship relationship at that level can be even more challenging at a distance, where a lack of local context can limit perceptions of authenticity [33]. Workplace relationship building can become further strained amongst barriers

in remote communication, such as a lack of nonverbal cues or misinterpretations in tone [133]. Additionally, mentoring that only focuses on skills may position the mentee as someone who needs to be “fixed” [86]. Rather than assuming deficits, mentoring should provide a safe space for people to authentically express themselves, including their various identities and lived experiences. Our research explores the design of interactive virtual environments (VEs) as *counterspaces* for workplace mentorship, i.e., safe havens of support and connection for marginalized individuals [93] where mentors and mentees can build their relationship together. As a first step in this direction, we focus on one-to-one relationship building in workplace mentorship.

2.2 Counterspaces for Marginalized Communities

Like mentorship, counterspaces can help marginalized individuals thrive in the workplace. Counterspaces are temporary social environments [52, 73] and are not necessarily tied to physical places (though they can be). Higher education research demonstrates that counterspaces contribute to the success and persistence of marginalized communities like Women of Color in STEM fields [93] and low-income, first-generation, and/or working class students in selective institutions [72]. Likewise, access to a workplace counterspace can significantly improve the quality of their work experiences, as seen in a Justice, Equity, Diversity and Inclusion initiative for Black, Indigenous, and People of Color (BIPOC) employees at a predominantly white institutions’ library [37]. Research also highlights that counterspaces challenge oppressive dominant culture through direct relational transactions [22]. This includes creating a sense of community and sharing adaptive strategies for responding to oppression [22], practices similar to those in mentorship meant to empower marginalized mentees [14, 113]. Prior CSCW research shows that online platforms can also be counterspaces, where marginalized communities have created and sustained spaces of work-related peer-advice on platforms like Reddit [111]. While these platforms may not necessarily exist within the workplace, virtual counterspaces can generate practices that strengthen the persistence and belonging of marginalized communities at work [110, 111].

Counterspaces are manifested by the people and practices that bring meaning to a space because they center marginalized people and counter oppressive dominant culture [93, 126]. Exemplars of counterspaces in the workplace are Employee Resource Groups (ERGs), employee-led communities formed around shared identities and affinities, which can improve marginalized employees’ sense of connection and belonging [23]. ERGs create counterspaces in the workplace when historically marginalized individuals and their allies collectively occupy a physical (e.g., a conference room) or virtual (e.g., video conference platforms) space towards supporting marginalized groups, including practicing mentorship. After ERG sessions end, however, such spaces revert to their typical workplace use. These counterspaces are temporary and often do not offer opportunities for historically marginalized groups and their allies to shape and maintain the space as shared havens of expression and long-term advocacy in the workplace. Thus, we explore how persistent virtual counterspaces, through the use of VEs, might create visible representations of long-term relationships focused on historically marginalized communities in the workplace.

2.3 VE Counterspaces and Training VEs in the Workplace

Counterspaces for historically marginalized communities have been explored and developed as and within VEs, or interactive digital worlds, predominantly in social video games. Despite oppressive mainstream gaming culture, historically marginalized communities have enjoyed safe spaces for identity formation in *Second Life* [18] that can carry positive effects into the physical world [17]. In another Massively Multiplayer Online Role Playing Game (MMORPG), LGBTQIA2S+ groups and their allies established alternative communities with inclusive social policies in *World*

of *Warcraft* [118]. More recent digital games, like *Kisima Ingitchuna* or *Never Alone*, a cooperative video game developed by Iñupiat and with Iñupiat elders, also function as counterspaces. Its virtual world embodies and celebrates Iñupiat culture while also forming community beyond playing the game, and decolonizing the education of Iñupiat youth [132].

While VE counterspaces have shown promise in gaming, their potential in the workplace is relatively unexplored. Prior HCI research has used VEs in the work context for collaboration [40], reducing implicit bias [8], experimenting with workstation configurations [28], training humans to work with robots [2], facilitating remote adolescent psychotherapy [45], and even for mentoring in specific fields such as higher education [75, 114] and healthcare [25, 43, 128]. Additionally, desktop-based VEs have been used to teach and develop complex job-specific skills, (though not via mentorship), including first responder situations training [87, 88], military training [24], mechanical assembly operations [12], spatial route-learning [78], and health care team training for high-stress critical-care situations [51]. Training VEs that *do* involve workplace mentorship are being explored in HCI research, e.g., AR and VR applications for practical guidance between expert and novice surgeons [43, 105, 128]. Still, VEs designed for holistic mentorship focused on historically marginalized individuals at work have yet to be investigated. Thus, we propose leveraging the affordances of VEs to design immersive mentoring counterspaces that could support historically marginalized groups in the workplace. For this initial exploratory research, we focus on desktop VEs, which are known to provide a sense of immersion [127].

3 Design Focus Groups

As a preliminary step to inform the design of a VE mentorship counterspace, we conducted three one-hour focus groups with nine participants over video using Zoom. We conducted these at JPMorganChase, recruiting from internal DEI mentorship programs focused on historically marginalized groups¹. We recruited the same way from a DEI sponsorship program, where sponsorship includes mentorship practices such as guidance as well advocating for and promoting sponsees in the workplace [53].

For each group, we asked participants to imagine a 3D VE dedicated to one-to-one mentorship, with a focus on historically marginalized individuals. To facilitate descriptive imagination, we asked ice breaker questions based on scaffolded self-disclosure protocols [97] to warm up participants to share about themselves. We then asked participants to share about their most recent experience with career-related mentorship, including what was especially impactful about their experience, what they would change about it if they could, and why. We then introduced the concept of VEs using examples from HCI and CSCW research, including their potential to provide immersive spaces for work meetings [95], social connection [116], and to cultivate community among historically marginalized individuals [1, 39]. We used narrative prompts to help participants imagine immersive VEs for mentorship. We asked them to imagine they were having a mentorship meeting in a VE to discuss strategies for expanding their roles towards promotion in the workplace (a common goal within mentorship programs at the institution). Participants responded to prompts around how the environment should be setup, what tools or abilities they would need to explore strategies towards role expansion, and what they would want to see upon entering/leaving the space.

3.1 Insights that Informed Prototype Design

Participants highlighted the importance of mentorship alignment on purpose and expectations. Past experience of misalignment included when mentors/sponsors were “volun-told and not volunteered. I didn’t feel there was a real passion, it was more of a check the box,” as one participant, a

¹Due to institutional policies, we were not permitted to collect individual demographics unless voluntarily self-disclosed

former sponsee, shared. Similarly, opaque mentorship practices and lack of communication made a mentee wonder about long stretches without interaction, questioning, “is this a test? If I sit down and do nothing are you going to do nothing too?” Relatedly, prior CSCW work suggests that sharing commitments to a collaboration can help build rapport and meaningful connection [71], which is key for building mentorship relationships [14, 54, 113, 125]. Because of this, we aimed to design a VE that encourages explicit communication around commitments via rituals, or built-in tasks for prompting communication.

Participants were also excited about relaxing, playful VEs in the hybrid workplace that supported their mentorship goals. They imagined virtual mentorship spaces that “provide a sense of openness with purpose.” VEs could bring novelty to workplace contexts, but it was key to ground focus in workplace-relevant interactions. With this in mind, we aimed to design an environment that could be engaging and delightful without derailing a mentorship meeting. Participants also wanted meaningful objects and “more continuous engagement” with topics and the mentorship relationship itself. HCI research shows that indeed, for historically marginalized groups, cultivating continuity for a strong, long-term mentorship relationship can be key to experiencing belonging and success in the workplace [47]. To address this, we considered including unique artifacts that could reflect mentorship in practice and serve as visual histories of the relationship.

Based on insights from the focus groups, we designed Mentorship Garden, a VE where users grow a garden together. The garden serves as a visual metaphor to symbolically ground mentorship practices and growth for users. We chose to leverage visual metaphors in the prototype, as prior HCI work shows that the flexibility of metaphor-based communication can support shared understanding. Ambiguity in a visual metaphor allows an individual to assign and interpret its meaning based on their personal lived experiences [104], which we felt could help users personalize the experience and share about themselves. While we envision mentorship VEs in the workplace could use various visual metaphors (e.g., constructing a house), we started with a garden because of its connotations of growth and established use as a metaphor in prior mentorship work [103]. Moreover, several participants imagined having a mentorship meeting in nature because it might be relaxing. We describe Mentorship Garden below.

4 Mentorship Garden Prototype

Mentorship Garden is a multiuser VE built on Babylon.js, a 3D engine for the web. We leveraged Babylon.js to create the VE, which users can enter through the web browser, navigate a first-person view with their keyboard, and interact with 3D objects with their mouse. The prototype used Azure Communication Services for synchronous audio/video communication, Colyseus for state synchronization of the VE, and leveraged Microsoft Teams for asynchronous chat and file storage.

4.1 Chatbot

Mentorship Garden includes a chatbot for users to input data to change the VE asynchronously. The chatbot enables easy, at-will personalization of a VE by mentorship pairs, without requiring them to code. Inspired by prior HCI work, which describes the need to empower marginalized individuals to create and shape technology [94, 115], we designed this feature to enable users to customize the VE with their own input. We developed the chatbot as a custom app within Microsoft Teams. It asks users to share their mentoring values, topics or experiences they want to discuss, their mood, and 3D objects they want in the VE. The chatbot sends their input to the VE, which changes based on users’ answers, detailed below. Figure 2b shows the chatbot collecting input for users’ mentorship values. We discuss how these input affect the VE below.

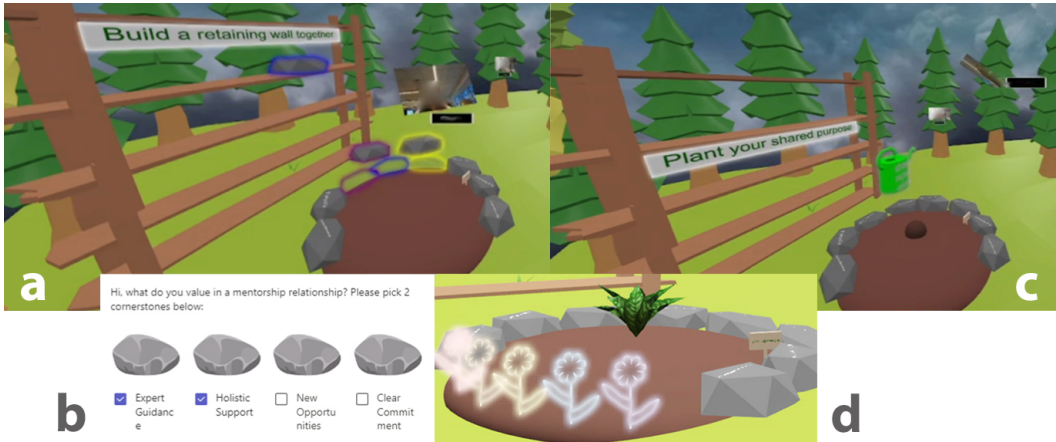


Fig. 2. (a) A pair moves stones from the shelf to placeholder locations in their garden to build a retaining wall that symbolizes what they value in a mentorship relationship. (b) Pairs choose what they value in mentorship through the chatbot. (c) A pair has planted their shared purpose seed and prepares to water it with their topic watering can labeled “share expectations.” (d) Glowing placeholders where pairs plant the mentee’s mood flowers in Session 1.

4.2 Garden Environment

We designed the mentorship counterspace as a garden based on previous studies’ mentorship garden metaphors [103] (see Figure 1). We designed it to appear as if the user is outdoors, where they can move in a small wooded area with a stream, bridge, gardening tool shelf, and a mound of soil. We chose this design based on insights from the focus group, where participants imagined holding their meetings in nature, as well as prior HCI research, which shows that outdoor nature VEs can be physiologically and psychologically restorative alongside the same benefits experienced physically in nature [91]. We chose simple, lowpoly 3D assets to populate Mentorship Garden, and included relevant ambient sound (birdsong, flowing water, a breeze) to facilitate a sense of being outdoors. We made these design decisions according to prior work, which shows that ambient audio, rather than high visual fidelity, is effective in supporting presence and immersion in a VE [32]. Also, because the prototype runs on the web, lowpoly assets were less likely to cause lag during loading and use. Users enter the VE via web browser. In the VE, users’ webcam feeds are visible as video tiles with their names, which they can move in the garden using arrow keys. They can also interact with glowing objects by clicking and dragging on them. Users can view each other’s webcam tiles moving, as well as objects they both move, while hearing each other.

4.3 Mentorship Rituals

We designed a set of rituals for facilitating mentorship conversations while providing comfort and immersion in the VE. Since mentoring pairs typically hold multiple mentoring sessions to build their relationship and discuss various topics, we developed rituals for two types of sessions. The first session introduces the garden and aims to help mentoring pairs build the foundation for their relationship, while the second session facilitates check-in conversations. We chose this structure based on prior work, where developing early shared understanding, and checking for alignment periodically after, can lead to better mentorship experiences for marginalized mentees [15, 113].

4.3.1 Session 1: Building Foundations. In Session 1, users interact with objects in the VE to establish the foundation for their mentoring relationship, and future sessions together. Based on insights from both the focus groups and prior research [49], which emphasize alignment between mentors and mentees, we designed the rituals in this session to focus on explicitly defining goals and expectations at the start of mentorship. The interactable objects sit on the garden shelf and prompt users to engage in these foundational conversations. Once users interact with the objects and complete a ritual, new objects appear on the shelves to guide users through the conversation.

Build a Retaining Wall Together. This ritual focuses on aligning mentors and mentees on their values for mentorship, which is key in effective mentorship relationships [84]. The first objects that users encounter on the virtual shelf are a set of stones. Printed on the stones are users' mentorship values, which they can input through the chatbot prior to entering the VE by selecting from multiple choice options. To determine potential values for users to select, we worked with organizers of the DEI sponsorship program from which we recruited participants for the design focus groups. We chose this program as it had a well-defined toolkit around structuring mentorship with a fixed set of values. We included values such as clear goals, clear communication, clear commitment, openness, new opportunities, holistic support, and expert guidance. In this ritual, pairs can move their value stones to virtually build a retaining wall around their mentorship garden together, using their answers on the stones as prompts to share what they value in mentorship and why. Figure 2a shows a pair placing their value stones around their Mentorship Garden together.

Plant Your Shared Purpose. This ritual focuses on aligning mentors and mentees on their purpose for mentorship, which is also important in quality mentorship [54, 84]. We aimed to encourage mentoring pairs to explicitly define their shared purpose using a virtual symbol, which functioned as a visual metaphor that can be flexibly interpreted, as in prior HCI work [104]. This way, they could assign their specific shared goal to the symbol. After completing the ritual to build a retaining wall, a virtual seed and watering can will appear on the next level of the shelf along with directions to "Plant Your Shared Purpose." Users can virtually plant the seed in the mound of soil and then use the watering can, labeled "share expectations," to water it as they explicitly discuss their shared purpose for the mentorship relationship. Watering the seed causes a sprout to appear in their Mentorship Garden, symbolizing the start of their progress on their shared mentorship goal in the VE. Since a growing plant could symbolize the progress of many different work-related goals, pairs could interpret it according to their own goals.

Plant Mentee's Mood Flowers. We included this ritual in Session 1 as part of users' initial setup of their garden, which they would see change over time in Session 2. After users plant their shared purpose, a set of grey flowers appear on the next level of the garden shelf. Users can drag and drop these flowers into designated spots on the mound of soil to add to their garden. These flowers are meant to represent the mentee's mood over time before their next session, which we explain in more detail in the following section about Session 2.

Decorate Your Garden. This ritual design was informed by prior CSCW research on how virtual objects of personal significance can be a helpful tool in relationship building online [50]. We envisioned that these objects could function as a means to share about oneself, by personalizing the space and prompting personal conversation, and thus build connection with each other [6]. The final objects that appear on the shelf in Session 1 are custom items that users can request through the chatbot, prior to entering the VE. For the purposes of this study, a researcher would search for 3D models of requested items on free online repositories. When we were unable to fulfill specific requests or participants did not input requests, we chose 3D objects that fit the setting, e.g., a bird matching the ambient noise. The custom objects appear on the bottom level of the shelf, and users



Fig. 3. (a) A pair's custom items from Session 1 and Session 2: a mini SUV, a chessboard, a bird, and a slice of pizza. (b) A pair decorates their Mentorship Garden with their custom pizza and football items. (c) A "wrap it up" reminder appears when 25 minutes have passed since their meeting started.

can interact with them at will, dragging and dropping them anywhere they would like as a means to decorate their garden or the space as a whole.

Open Time. We included this ritual to enable mentorship pairs to define a portion of the mentorship meeting themselves, such that the entirety of their time together would not be just pre-designed rituals. After completing all the built-in rituals, pairs are free to use the VE and remaining time in the prototype however they want. This can include exploring the virtual space, openly discussing topics of their choice, and if desired, leaving the prototype early.

Closing Time. We designed this ritual to unobtrusively inform pairs that their mentorship meeting is almost over by transitioning the ambient sound into music of their choice. This design is informed by the focus group participants sharing that music preferences could be a fun way to learn about their mentorship counterpart. Similarly, self-disclosure in this way can facilitate closeness [6]. Five minutes before the end of the meeting, the prototype plays music in the background, and a reminder to "wrap it up" appears over their garden. Pairs can select their own closing time music from a set of options that we provide through the chatbot, prior to entering the prototype. We provided calming music options that matched the comforting, relaxing atmosphere we wanted to foster, while ensuring that the change in audio would not be a jarring or stressful transition to the end of the meeting. Pairs can then leave the virtual mentorship garden at their discretion.

4.3.2 Session 2: Progress Check-ins. In Session 2, mentorship pairs have the opportunity to discuss their state and progress since the last session. The rituals in this session aim to encourage continuous engagement between mentors and mentees. We designed them according to feedback from the focus groups, as well as prior work suggesting that structured sessions that build on previous ones can strengthen mentorship relationships [27]. The garden starts in the same state that users left it, with users' seedling and custom objects from the previous session, enabling a persistent VE for users to reference their prior meetings and continue to build and make their own. Users will also see new objects on their garden shelf, prompting new conversations about their experiences and goal progress since the last time they met.



Fig. 4. (a) The chatbot collects input about the pair’s progress since their first session. (b) The pair waters the mentee’s mood flowers to reflect the color that best represented how the mentee was feeling over time since Session 1. (c) The pair completes their watering can topics and tasks, and their mentorship seedling has already grown as tall as it can in the prototype. When they nurture it further, it glows to show that they are continuing to grow their mentorship.

Use Your Custom Items at Will. This first ritual in Session 2 builds on Session 1’s Decorate Your Garden ritual, where pairs can continue to share about themselves and personalize the space to build their relationship with each other [6]. Users will have new custom objects, which they can request in the same way as they did for Session 1, and place wherever they would like at any point.

Tend to Mentee’s Mood Flowers. We designed this ritual to encourage check-ins about emotions, as discussing emotions related to work as part of workplace mentorship can facilitate well-being [59]. Furthermore, participants in the design focus groups desired such support in mentorship, including discussing topics such as “mental health...it’s not something we talk about in the office.” Drawing from HCI research suggesting the use of visual objects to communicate emotions [67], and prior HCI work on effective visual metaphors [104], we use colors as symbols for moods that could be flexibly interpreted. Prior to entering the environment in Session 2, the mentee can asynchronously input their mood through the chatbot. The chatbot prompts them to select colors that represent their moods in the days between the current and last mentoring session. The garden uses this input to spawn watering cans of the same colors on the shelf. Pairs can use these watering cans to water the flowers they planted in Session 1, and subsequently color them with the mentee’s mood colors. This feature encourages pairs to discuss the mentee’s color choices to understand the mentees’ emotions over time since their last session. For the purposes of the prototype, we designed the ritual to hold mood colors for five work days, assuming one work week between mentoring sessions.

Tend to Your Seedling. This ritual aims to spur meaningful engagement with mentorship progress. The design focus groups emphasized a need for long-term continuity in their relationships, wanting to address goals without spending too much time recounting prior conversations. Drawing from prior work, we use artifacts to represent the history of their professional relationship, which can also help form positive connection [106]. Mentorship Garden uses the seedling planted in Session

Table 1. Participant Table. * indicates individual also participated in design focus groups.

Pair	Mentee (level)	Mentor (level)	Mentorship Background
1	P1a (mid)	P1b (senior)	Not yet engaged in mentorship, paired per request and by level
2	P2a (junior)	P2b (mid)	Prior informal mentorship relationship, bidirectional
3	P3a (mid)	P3b (senior)	Prior mentorship relationship, carried over after mentee's role change
4	P4a* (mid)	P4b (mid)	Prior mentorship relationship, carried over after initial mentorship program's end
5	P5a (junior)	P5b* (mid)	Prior mentorship relationship, carried over mentee's role changes
6	P6a (mid)	P6b* (mid)	Prior mentorship relationship, includes shadowing
7	P7a (junior)	P7b (mid)	Prior mentorship relationship, guiding the mentee with work and interpersonal goals
8	P8a (junior)	P8b (mid)	Prior informal mentorship relationship, akin to a new-hire buddy
9	P9a (mid)	P9b (senior)	Prior but relatively new sponsorship relationship, getting to know about each other's work
10	P10a (mid)	P10b (mid)	Prior mentorship relationship, carried over with mentee's role change

1 as an informative artifact, saving the state of the seedling's growth for reference and further interaction in following sessions, and structuring the time with a focused check-in based on the seedling's state. Between sessions, the chatbot prompts users about any progress on the shared goals they discussed in Session 1 (Figure 4a). The chatbot also collects up to two new topics or tasks users want to go over during this session, which appear on the new topic watering cans that spawn on the next level of the shelf. We include a third watering can labeled "expectations check-in," to encourage pairs to explicitly communicate and align while in their Mentorship Garden. Each time they cover a topic or complete a task on the watering cans and water their seedling, the plant grows to reflect their mentorship progress. For the purposes of this research, we limited the growth of the plant to four stages. Pairs can continue watering the plant after it's fully grown; while it will no longer grow, it will sparkle with a particles effect to indicate that they are continuing to nurture it.

Open Time and Closing Time. These rituals are the same as in Session 1, giving time for users to use the space as desired and reminding them that their meeting is almost over.

5 Methods

To evaluate Mentorship Garden, we ran a field study at JPMorganChase, with 10 mentoring pairs who used the prototype for two mentoring sessions each.

5.1 Participants

We recruited people who had participated in internal DEI mentorship programs, inviting them to join as a mentor or mentee with a mentoring partner of their choice. We also recruited from our prior focus group participants; three participants joined the study with partners who had not been part of the focus groups. Two participants did not have a mentoring partner; therefore, we paired them up at their request to start a new mentoring relationship. We recruited 10 mentoring pairs, or 20 total participants. Pair mentorship relationships included senior-junior and peer mentorship. Due to the institution's privacy and data policies, we report the demographics of our participants in aggregate. We recruited all participants from pre-existing groups focused on supporting historically marginalized employees, some of which were identity-based and some which also included allies.

This included ERGs, DEI programs, and DEI mentoring programs. We only report individual-level demographics that were self-reported during semi-structured interviews (detailed below). Participants included 4 people who were within the 20-30 age range, 6 in the 30-40 range, 6 in the 40-50 range, and 4 who were 50+. We had 13 female participants and 7 male participants. 3 participants identified as Hispanic or Latino, 6 as Black or African American, and 10 as White. Of these participants, 1 participant also identified in their post-interview as a member of the LGBTQIA2S+ community. Participants joined from various locations across the United States. Participants had different levels of seniority in the institution, including 3 senior-, 13 mid-, and 4 junior-level employees.

5.2 Procedures

Each mentoring pair participated in two online 1-hour research sessions on different days during their work hours. The first research session involved the rituals described in 4.3.1, while the second research session involved the rituals described in 4.3.2. Sessions were held 1 to 5 workdays apart, with smaller gaps necessitated by participants' schedules. Each session was segmented as follows:

Onboarding Phase (15 mins). Research sessions opened with a research team member facilitating technical setup with participants. Then participants were asked to answer questions from the chatbot, which would update the content of their Mentorship Garden accordingly. Then, they were introduced to Mentorship Garden and its rituals before entering the prototype via web browser.

Interaction Phase (30 mins). We designed the prototype for 30 minute meetings during the workday to reflect participants' typical work mentorship meetings. Because mentorship meetings may include discussion of private and sensitive topics [13], we did not record audio so that participants could feel free to discuss any topic during their meetings. During both sessions, a research team member joined the participants in the prototype (without a webcam tile so that they appeared invisible) and facilitated as needed via audio, i.e., answering questions or resolving technical issues. The research team member also observed pairs in real-time in Mentorship Garden, noting salient interactions. The observations informed possible questions for the next phase, i.e., post-session interviews (e.g., the research team member observed that a mentorship pair moved their custom objects while laughing, which we later asked about during interviews. Participants shared how they enjoyed "goofing around" together in the VE, even if they were still at work. This in turn informed our results, such as themes around play).

Interview Phase (15 mins). Finally, we conducted post-session interviews with mentors and mentees in separate video calls, which we audio recorded for analysis. We asked participants about their experiences in the prototype, their thoughts about the rituals and metaphor of the garden for mentorship, as well as how they envisioned using technology like the prototype in the workplace for mentorship and other potential uses. We also asked about their thoughts on how the prototype or similar technology could support historically marginalized employees in the workplace given their personal experiences with technology, DEI in the workplace, and ERGs. The protocols for the interviews after each of the sessions differed only in terms of which rituals were discussed (i.e., rituals present in only the first session were not discussed in interviews for the second session).

Throughout the study, we iteratively refined the usability of the prototype based on observations during the Interaction Phases and feedback that participants shared in Interview Phases to reduce technical hangups.

5.3 Data Analysis

We conducted reflexive thematic analysis [16] of our post-interview data. To do this, we reviewed salient quotes (from manual transcriptions of audio recordings) of post-interviews, and generated a set of code categories (e.g., “transforming work meetings”). We iteratively coded transcripts according to these categories, discussing frequently to ensure alignment on the codes. We then used affinity diagramming and open discussion to inform themes and their definitions based on the participant quotes. We conducted this affinity diagramming and open discussion several times during data analysis to refine our themes and insights.

6 Results

Our findings demonstrate that the design of the Mentorship Garden supported mentorship in the workplace. The metaphor of the garden and its rituals helped provide a visual grounding for participants’ mentorship relationship and conversations, when participants were not distracted by its mechanics. Mentorship Garden also fostered new kinds of work interactions, including more opportunities to bond and connect with each other. Participants described some concerns about how to integrate such a prototype in the workplace, but ultimately perceived it as a counterspace that centers the well-being and professional development of marginalized individuals [93], existing as a comforting environment distinct from their typical work settings. Finally, participants imagined the potential for this counterspace to be used in workplace communities focused on historically marginalized identities. We describe these themes in detail below.

6.1 Effects of Visual Metaphors on Mentorship

Our prototype used the visual metaphor of a garden to leverage connotations of nurturing practices and healthy growth. We designed mentorship rituals to match the underlying garden metaphor, so that across conversations and interactions, participants’ mentorship interactions in the garden could feel cohesive. As many participants shared, the design of the environment and its rituals had the intended effect of supporting pairs’ mentorships in the workplace. At the same time, some participants had difficulties relating to the visual metaphor or felt it was distracting.

6.1.1 Visually Grounding Mentorship Relationships. Overall, participants felt the visual metaphor of the garden and their interactions with it through the rituals helped ground their relationship with each other. In particular, the Tending to Your Seedling ritual in Session 2 became a way to embed pairs’ mentorship relationships and progress in the VE. After planting a seed of shared purpose together in Session 1, participants returned to their Mentorship Gardens to continue to work towards that goal, virtually and symbolically watering their seed as they progressed. Participants shared that planting, watering, and growing a seed into a plant reflected the work they did together as well as their relationship with each other.

Pair 3, for example, felt that the large, lush plant they had at the end of Session 2 was a good representation of their progress on their shared mentorship purpose, and a reminder to maintain their relationship. Pair 3’s relationship had shifted from manager-direct report to mentor-mentee in the past year, after P3a changed teams. P3a appreciated visualizing this shift through their garden:

“Tending to my tree or plant makes me think about how [my mentor] and I... need to care for this relationship, just like I’m caring for and growing this tree...I’ve worked with [my mentor] for about a year now...our relationship has changed...it’s blossomed and bloomed...it’s really grown...it was a really good representation of how our relationship and mentorship has grown in the last year.” - P3a

Aligned with prior work, nurturing and maintaining a professional mentoring relationship in this way can cultivate belonging, persistence and success of marginalized people in the workplace [130]. As participants shared, the visual metaphor helped frame the mentorship sessions as not just individual meetings, but the effortful growth of a professional relationship over time.

Custom items in the VE also served to visually ground self-disclosure during mentorship sessions, as designed. Self-disclosure is a key aspect of building relationships [6, 97]. Participants disclosed about themselves by requesting custom objects for the VE that they liked or were of personal relevance to them, to express their identity to each other. For example, Pair 4 had been in a mentorship relationship with each other for almost a year. Despite the length of their relationship, the items they requested allowed them to learn new things about each other:

“[My mentor] is a chess player. I actually didn’t know that [before the session]...I play chess too...they pick[ed] a chessboard [for their custom item], so already, from before we even have a conversation, because we pick those things...it gives you some insight into that individual.” - P4a

Building rapport by sharing about oneself can signal commitment and interest in the mentee’s professional *and* personal development [29]. For historically marginalized individuals, welcoming non-work topics into mentoring sessions can create a sense of connection that contributes to quality mentorship experiences and, subsequently, retention of employees [113, 125]. As described above, choosing custom items for the VE led to new discoveries that facilitated holistic rapport, even in a long-established mentorship relationship. Thus, by visually representing mentorship progress over time and providing a lightweight means to self-disclose, the Mentorship Garden could provide a layer of personal connection for grounding and strengthening relationships.

6.1.2 Facilitating Important Mentorship Conversations. We designed most of the rituals in the Garden to kickoff key mentorship conversations, informed by the experiences of participants from our focus groups. The Build a Retaining Wall Together ritual aimed to do this by highlighting participants’ mentorship values on the stones that they used to build their garden wall. Participants’ responses showed that the ritual indeed facilitated pairs to explicitly communicate and align their desires and expectations for the mentorship.

P5b had been a mentor for P5a for over a year, usually working with their mentee on preparing them for new roles. They described how they used the stones in the ritual as a focal point for their mentorship session that helped align their goals:

“I really like [the stones] because you’re setting a foundation...‘these are things that I value and I want to make sure that we work on’...you can set that foundation of what our goals are versus what your mentee’s goals are so that you can make sure that they’re aligned.” - P5b

Similarly, we designed the Tend to the Mentee’s Mood Flowers ritual to facilitate dialogue about the mentee’s feelings in between mentorship sessions, where pairs could water the mentee’s mood flowers to see color representations of their mood. This encouraged social support, where mentees could open up about their struggles and seek help when needed.

P2a, for instance, appreciated the opportunity to talk about their feelings when they normally would not have. They described having a long-term, informal mentorship with P2b, akin to a peer mentorship in it’s bidirectionality. P2a reflected on the five mood flowers they watered with P2b:

“Being able to choose the colors to represent the [mentee’s] moods to discuss the flow from day to day instead of just a general topic really helps open up and build a mentorship relationship because normally you wouldn’t talk about your feelings day

to day, it would just be like ‘I’m having this issue’ but the feelings can drive out issues that you might not realize are going on.” - P2a

Taken together, the Mentorship Garden rituals provided structure for important conversations, including those to help pairs ensure they were aligned on their values, as well as dedicated time and space to speak about emotional well-being as a norm. Moreover, creating an intentional, safe space for mentees to express their feelings is important for marginalized individuals, who experience micro- and macro-aggressions both in and outside of the workplace [113]. Mentorship Garden provided opportunities to engage in deeper conversation and recognition of issues at work.

6.1.3 Detracting from Mentorship Practices. Though most participants appreciated the visual metaphor of the garden, a few participants felt they were too on-the-nose and struggled to connect with them as part of their mentorship practices.

This was P1b’s experience as the the mentor in Pair 1. Unlike all other pairs, Pair 1 had no prior relationship with each other and had asked to be paired with someone new. Thus, Pair 1’s mentorship interactions were fully remote and contained within their 2 sessions in their Mentorship Garden. P1b reflected on how the rituals may be too childish for them to use for establishing mentorship:

“It’s neat and creative...but probably a little cheesy...the concept of it and what you’re trying to relay from an interpretation standpoint, I get it...my kids would think it’s cool...but for me, I don’t know I get a lot out of that.” - P1b

On the other hand, participants like P2a shared, “I like the ritualistic part of it...I think some people might see this as cheesy. I like cheesy.” Participants thus had divergent opinions on how to engage with mentorship rituals in 3D VEs.

For some, the VE was less helpful and more distracting. While this in part is due to early interaction controls that we iteratively improved upon during testing, some participants felt that interacting with the rituals in general affected their existing mentorship practices. As detailed in the previous section, P2a found the mood flower ritual supportive of mentorship; however, their mentor felt differently:

“Honestly, when [the ritual] stopped working [could not finish watering flowers], it was like ‘okay, cool, let’s just forget about everything else’ and that’s when we actually started talking, and it was less about like the simulation and more about just actually talking and engaging.” - P2b

These instances of distraction, particularly due to having to perform actions to complete rituals to progress through the mentorship session, highlights the importance of different mentorship preferences and styles that need to be considered when designing virtual mentorship environments.

6.2 New Kinds of Work Interactions

In addition to supporting existing conversation-focused mentorship practices, Mentorship Garden fostered new types of interactions between pairs in the workplace. This was in part due to the novelty of engaging in a 3D VE at work, where many participants had “never experienced anything like it” (P8a). The design of Mentorship Garden created opportunities for participants to interact differently, as well as helped them imagine new ways to collaborate using 3D VEs. However, participants also considered what it would mean to integrate these novel interactions into the workplace, given existing tools and preferences.

6.2.1 Expanding the Bounds of Workplace Interactions. Building, decorating, planting, and watering objects in the Mentorship Garden together in real-time helped pairs experience new kinds of collaboration in the workplace. These rituals added a layer of shared focused interaction that

offered a change of pace in typical work days that involve “being on [video conferencing] meetings all day long” (P2a).

This was the case for Pair 6, a mentorship relationship involving the mentee (P6a) “shadowing” their mentor (P6b) as a new hire on their team. Their mentorship meetings typically take place remotely over [video call]. As a relatively early mentorship relationship, this pair enjoyed the ability to connect in new ways:

“I’ve been in a mentor-mentee situation before and it would help rather than just talking about what you can do for your mentee or how they can help you teach them or make them feel comfortable, [the prototype is] a good way for them to do it as a hands-on experience.” - P6b

“[The experience in the garden was] more intimate... you’re doing a little bit more bonding as opposed to just sitting there and talking to someone on [video call]...”
- P6a

Participants also envisioned their own custom rituals for their Mentorship Gardens that could further expand how they connect. For example, P7b, the mentor in Pair 7, used their Mentorship Garden as a space to express gratitude before the holidays. Based on their experiences, P7b imagined a ritual for recognizing people and their work:

“Recognition is really powerful...I want to take a moment to reward her and recognize her for the work that’s done...like ‘I see you, and I see the work that you’ve done, and great job’.” - P7b

P9a, the mentee of Pair 9, proposed rituals that could support new interactions around career development. Pair 9 is a sponsorship relationship; as P9a describes, the sponsor is an “advocate...someone who’s going to have your back at the end of the day [when] there’s a decision to be made.” To demonstrate their professional development to their sponsor, P9a imagined an environment akin to *Farmville*, focused more on programs and projects and featuring a final presentation:

“Each of these projects represents a sort of plantation...you can have different kind of farm animals that represent your [professional] spirit and your experience, your excitement about these [projects]...it makes it playful and engaging...really showcase your world and your growth through this project...like ‘this is a farm built on top of the work that I’ve done over the past two years with my sponsor’.” - P9a

Like P7b and P9a, participants were eager to use their VEs for mentorship and new forms of workplace interactions. Not only did participants experience a new way to collaborate in their Mentorship Gardens, they also rapidly proposed additional formats to connect and communicate with each other in 3D VEs in the workplace. The spaces and rituals they described (e.g., celebrating each other’s work, showcasing personal/professional development over time) demonstrate their desire for VEs to simultaneously support professional utility (e.g., learning in an interactive setting vs a video call) and more personal connection (e.g., feeling closer despite being remote). Both of these aspects can inform quality guidance built from positive relationships, in which marginalized mentees can feel seen, heard, and supported [15, 29, 113, 125]. Mentorship Garden could thus help expand how people interact with and uplift each other at work.

6.2.2 Integrating with the Workplace. Participants noted that video conferencing dominates the workplace, and that tools for mentorship may already exist. While they recognized the value and potential of introducing 3D VEs for mentorship, they also considered what it may take for employees to adopt the technology, even just as an option.

First, though participants described benefits to using interactive VEs over “the monotony of just sitting in a room or staring at someone on [a video call]” (P2a), they also pointed out that structure and guidance may be necessary to ensure that they stay on task. If they are unable to accomplish their mentorship goals, an experience like the Mentorship Garden may lose its value compared to existing meeting platforms:

“If you just went into that room without a structured plan... it would really be more of a distraction and learning curve than using the time to talk to someone in a [video call].” - P1b

Participants also wished for additional features that they typically use in their mentorship meetings, such as screen-sharing and taking notes. They highlighted how these features would be useful not only to help users keep track of their activities and discussions, but also to support task-oriented discussions. P10a, a seasoned mentor with several mentees, shared:

“[We mentor to] help them improve performance...help them understand where their metrics stand... So screen sharing is important. Note taking is important. Being able to work on any content you want to work on is also important.” - P10a

Finally, due to the low-poly appearance of the virtual environment and the manipulation of 3D objects in the web-browser, many participants viewed the prototype as similar to a game, likening it to *Minecraft* or *Roblox*. While some found this delightful, others cautioned that games may be difficult to integrate in the workplace. Mentee and mentor participants across all generations in our sample pointed to age as an important factor for this. P4a brought up further concerns around individual experience, background, and preferences around game-like environments:

“I’ve been [with the institution] 26 years...I’ve noticed in some of our mandatory training is that they’ve introduced some gaming elements... it’s just kind of fun to me, but I think if people aren’t necessarily geared that way I don’t know if they’ll come back to it.” - P4a

At the same time, P4a shared that the design of the prototype could also create the opportunity to act as a bridge connecting different generations in the workplace:

“If people are thinking about ‘well how do I bridge the gap of connecting more senior people with more junior people’...would this help with that? Possibly it would, because the people we’re targeting to mentor, to apply mentorship to, that might catch their attention.” - P4a

Participants recognized the added value of mentorship interactions in a 3D VE. However, they highlighted existing tools and features that set standards and expectations for what should be included in virtual mentorship spaces in the workplace. Still, participants felt integrating virtual mentorship counterspaces in the workplace could be beneficial, e.g., bridging connections between senior and junior employees.

6.3 Mentorship Garden as a Workplace Counterspace

Despite concerns around how to integrate 3D VEs at work, participants’ experiences suggest that the Mentorship Garden functioned as a counterspace [93], purposefully distinct from typical work settings. In corporate settings, employees (especially members of historically marginalized groups) can experience high stress and pressure to perform, which can negatively affect their well-being [66]. In contrast, participants felt their Mentorship Gardens were spaces of comfort and play at work, as if they were in an alternate reality from their usual work setting.

6.3.1 Feelings of Comfort in the Mentorship Garden. The design of the 3D VE and its contents set a positive tone and atmosphere for participants. “Little touches” like ambient noise, surrounding

clouds, and the ornamental objects in the environment encouraged a sense of comfort and ease. P5a highlighted how the Mentorship Garden felt distinct from their typical work environment, and how they felt so at ease through its design that they would also want to have their performance reviews with their supervisor in the space, which is typically a stressful conversation. P5a shared:

“It’s work related, but in a relaxing place...I would love to have my sessions with my manager [here]...you leave the whole conversation and mentorship session so positive, so relaxing...to me it changes the whole thing.” - P5a

Participants also felt the rituals matched the relaxing atmosphere of the environment, while balancing the need to stay focused and productive. For instance, the Closing Time ritual, which gently alerted participants when their meeting was almost over with background music, contributed to pairs’ comfort while still helping them keep time. P3a described how the ritual did not rush them nor break the positive atmosphere of their Mentorship Garden:

“It was just subtle...it wasn’t like a gong...or a buzzer... we’re like, ‘oh, yeah, this is our cue. We’ve got to go back’...it wasn’t alarming or overwhelming...it’s soothing.”
- P3a

Additionally, the rituals as well as the environment were conducive to more comfortable communication that was still situated within the context of the workplace. While we designed the prototype with a focused area centered on the garden rituals, participants were free to move around other parts of the environment. The prototype encouraged them to explore, where they could flexibly pass through the ground or fly through the air, and not be locked into viewing the webcam tiles of their counterparts. For some participants, this provided a less rigid experience of communicating with someone they were virtually co-located with. P9b spent most of the mentorship session flying through the air and heading off in different directions to explore. They enjoyed being able to freely view the space, rather than only their sponsee (P9a):

“I couldn’t really see [my sponsee]...normally you see the person...I felt that you could have even a more open dialogue because there’s that extra layer. You just don’t really see the person but you have this peaceful nature around you and it just makes you feel very safe and very open to have a dialogue.”

Our prototype design fostered a sense of calm, safety, and space for both open expression and exploration. Providing this space is especially important in mentoring for marginalized individuals, where they can intentionally have sensitive, complex dialogues around intersectional identities and their marginalized experience [79]. Mentorship Garden began to do so for our participants by making room for open and vulnerable communication.

6.3.2 An Alternate Reality from Typical Workdays. Although the Mentorship Garden was contained in a web browser window, which participants accessed during their typical work hours, participants felt they entered a place distinct from work, yet still part of their workplace. The “little touches” previously described, all contributed to an atmosphere that was in strong contrast to corporate office spaces, and helped immerse participants in an alternate reality:

“[This] virtual reality², it works with the brain...you are really believing that you’re growing [your mentorship garden], it makes you have that feeling...you’re experiencing something different.” - P17

Participants appreciated this change in environment as they shifted from their typical workday activities to a mentorship meeting. This was especially the case for people who typically held their meetings over video calls, such as P2a and P2b. P2a recalled:

²Some participants referred to the prototype as a web-based virtual reality, even though it did not use virtual reality headsets.

“It was a nice breath of fresh air and took you out of that meeting mindset and got you comfortable in a different environment, almost like you were in an office and you went for a walk for your mentorship...I would do that again over [a video call] any day.” - P2a

Furthermore, some participants noted how being transported to a comforting space in the context of work, yet apart from their work environment, encouraged more open engagement. P5b compared their Mentorship Garden to their typical work environment in the physical reality of their office, where they usually met their mentee:

“We’re not so used to being outside and hearing things other than other [coworkers] taking calls or hearing people walk by, by having that more natural feel by being out in nature, you hear the birds, you see the sun...you’re in a different space...you’re more likely to open up because you’re focused on the nature side of the setting you’re in, versus that cold office space.” - P5b

Participants felt immersed in a space set apart from their physical environment, a place where they could see their coworkers and themselves communicating differently in the workplace with a sense of openness. This aligns with prior research on workplace environments and their positive effects on employees’ performance and experiences, where relaxing environments for collaboration are key to commitment [136]. Research shows that even brief exposure to nature [108], e.g., a garden [120], can improve employee well-being and reduce stress, even virtually [91]. These effects could be especially impactful for marginalized communities, as they typically endure compounded stress daily [90, 135].

6.3.3 Playfulness in the Mentorship Garden. Throughout our study, we observed many instances of play between mentorship pairs. Custom items and the ability to defy laws of physics in the environment enabled this, especially during the Open Time ritual, where pairs could “do whatever they wanted.” Moreover, participants engaged in play even in moments of breakdown, where the prototype was not functioning as expected or where participants got random custom items (either due to not requesting any, or the research team being unable to find objects they requested). As detailed earlier, the sense of comfort, ease, and openness in the prototype made room for play.

This was especially salient to P3b. Since this pair did not make custom item requests, we provided 3D objects that might fit the outdoors environment, such as a lowpoly dog. Though Pair 3 did not request the dog, they spent their Open Time moving it around and discussing it, thinking it was a pig. This unexpected addition created a moment of play:

“It’s actually not a bad thing sometimes...to throw pieces in there that have absolutely nothing to do with it...[my mentee was] like, ‘Let’s name the pig,’ and I think it drives conversation around the randomness of that. And [it] could lead back to good conversation around, why do you think that thing is here? ... I don’t think it should all be so scripted. Sometimes just throwing it off like that is a good idea.” - P3b

Similarly, Pair 4 engaged in play at a moment when the prototype did not function as expected. They ran into a technical bug when trying to complete the Tend to the Mentee’s Mood Flowers ritual. As the research team facilitator troubleshooted the prototype in real-time, Pair 4 played with the custom items in their garden. P4b recalled:

“We just were kind of goofing off and it was kind of a free ‘Hey, checkout my BMW’ and ‘Look, I can move it over my pizza’ and it was a way to relate to the other person in just a human, fun way...we kind of made up our own little ‘Hey, let’s do it this way’ type thing.” - P4b

These participants found moments of play in the prototype valuable for their professional mentorship sessions. This notion is reflected in research, where play can support how employees can adapt to change and uncertainty [11], their inspiration, innovation, and well-being [62], their work performance and self-efficacy [77], and collaboration, flexibility and creativity [70]. Play also has a history of positively impacting historically marginalized groups, including through theatre [98], poetry and dance [57], and digital play [132]. In Mentorship Garden, pairs were able to experience an intersection of play and professional practice, finding new ways to enjoy their time together at work.

6.4 Supporting Workplace Communities

Recognizing the Mentorship Garden's counterspace qualities, participants imagined how the VE could foster workplace communities for those who are historically marginalized. This included using the prototype as a way to balance power amongst mentors and mentees, as well as foster openness to difficult but important conversations about DEI in the workplace, and cultivate allyship. Furthermore, participants highlighted the opportunity for identity expression within historically marginalized communities through customization.

6.4.1 Balancing Power while Learning to Work in a VE Together. As the Mentorship Garden helped create distinct places from participants' typical work environment, some participants imagined the potential for these places to level out power imbalances in the workplace. The physical reality of work environments includes systems and implicit norms that privilege certain groups above others [131]. The design of Mentorship Garden thus provides a new setting that can minimize if not do away with that power imbalance, as both mentor and mentee need to learn to navigate that setting together. P2b reflected:

“[The prototype] strips away the environmental aspects [of the workplace] and creates a shared area that both of you have literally no clue on. It's a brand new world. It just makes it base level.” - P2b

This result builds upon prior research, which shows that VEs like *Second Life* can mitigate power imbalances (in their case, through the relative anonymity of avatars) [30]. Similarly, simply interacting in Mentorship Garden can mitigate perceptions of power between mentorship pairs because they are both new to and learning together in the VE. As historically marginalized individuals in the workplace are especially vulnerable to negative effects of power imbalances [58, 74, 80, 85, 100], the design of our prototype demonstrates the potential to nurture their well-being at work through a shared learning experience.

6.4.2 Facilitating Important Difficult Conversations at Work. Just as some participants felt the prototype could function as a good icebreaker and conversation starter, P1a imagined similar use for supporting historically marginalized communities in the workplace, especially in the context of Employee Resource Groups (ERGs). P1a described their experience learning as an ally, as ERGs helped them better understand the experiences of other historically marginalized individuals at work. They highlighted that conversations around DEI at work are often difficult, but that the Mentorship Garden could help facilitate those difficult conversations. P1a reflected:

“[In the past I learned about situations] that I would have never imagined people feeling uncomfortable in...I'm a white woman, there are certain things that, just innately, everybody has different experiences...[using the prototype and rituals] you could have the different rocks be about examples of when you felt vulnerable, or when you felt uncomfortable...so it'd be the opening of the conversation...the interactivity to get

people to open up is what VR can really bring to the table that you don't get always in just a regular conversation..." - P1a

P1a also recognized the importance of consent and agency when historically marginalized communities share about their lived experiences in any space. Rather than making individuals objects of another group's learning, they imagined how the VE (which they viewed as akin to VR due to their sense of immersion) could protect their privacy, personhood, and provide space for expression.

"When you click [on the rocks] maybe it's a video of someone opening up about their example. And that would be like we're all watching it together and then 'okay now let's talk about that'...it could be almost anonymous too if you didn't feel really comfortable...you could [configure] it where you could feel safe being a part of that conversation." - P1a

Along the same lines, P4a envisioned how conversations like this in the prototype could cultivate allyship. P4a imagined virtual counterspace like our prototype facilitating allies learning about the experiences of historically marginalized groups, and how to better support them:

"[Using 3D VEs] with the hope that allies walk away with a slightly better understanding of people that don't look like them or people that aren't in their position...and then maybe the people that we're trying to make sure that we elevate, get some additional insight into [how allies] can help in some way...it's definitely a two-way street."

Participants felt the VE could facilitate new ways to understand their coworkers, while also protecting marginalized individuals who vulnerably and bravely share about their own experiences. They imagined Mentorship Garden could serve ERGs which already celebrate marginalized communities, and cultivate allyships without identifying individuals as props for others' learning.

6.4.3 Identity Expression in the Workplace through Customizability. Throughout our study, participants interacted in a 3D VE via webcam tiles, which they could move around the space. Though this enabled participants to see each other's faces and facial expressions directly, many participants wished to have the option of 3D avatars. Aligned with prior work on the experience of queer people in social VR [39], P5b shared how customized 3D avatars in the workplace might provide space for historically marginalized individuals' identity expression:

"I'm [involved in the LGBTQIA2S+ ERG leadership], and I definitely feel something like this would be really beneficial, especially if you're having a mentorship with someone [who is] transgender or non-binary, being able to choose an avatar that is more closely matched to who they are, they would be more comfortable with themselves and be able to open up to you about their experiences." - P5b

Participants further highlighted the importance of being able to express identity through the rituals and the environment. Participants proposed several alternative metaphors to symbolize mentorship in the workplace, such as building a house, working on a car, or doing activities on a beach or in the mountains together. They explained how the experience needs to be relatable, or otherwise can become restricting instead of supportive. For example, P4b shared:

"I'm not a garden person...I'm not saying there needs to be a female and a male version or anything like that, but if there's something gender neutral that everybody can identify with, it would be nice." - P4b

Participants described how the environment could also change according to community needs. P6b noted how each ERG has specific identities and cultures that could be reflected in the space, to

help make it theirs. As ERGs typically have members who are distributed, this could subsequently help them establish their own space that they can return to:

“I am a member of the [Hispanic and Latino ERG group] and so I think...maybe tweaking it to that specific ERG, for example, we just celebrated Dia de los Muertos so having that type of environment to tailor to that, or to the [Black Leadership ERG group] like different colors, different schemes...would be more appealing to those...groups to make them feel like they actually would want to try to use it because it’s something new, it’s something different, but it’s also tailored to them and their specific [ERG].” - P6b

Participants viewed their Mentorship Gardens as sites for potential customizability to make way for various forms of identity expression in the workplace. This included avatars as mediums of personal expression for marginalized groups, options for more relatable environments, and the ability for people to reflect their culture and other things important to them in the space. This aligns with prior HCI and CSCW work, which suggests the need for online counterspaces to meaningfully engage marginalized individuals with their intersectional identities while connecting with others [34–36, 44]. Mentorship Garden could thus provide a space for meaningful marginalized identity expression, with pairs imagining further customized environments and rituals.

7 Discussion

Our results suggest how the design of Mentorship Garden can support mentorship for marginalized individuals in the workplace. At the same time, our participants imagined how its benefits could extend to all employees. This aligns with prior work in HCI, which shows that long-term professional mentorship uplifts not only marginalized people, but also everyone in the workplace by challenging oppressive patterns [47]. We discuss opportunities for further research on virtual mentorship counterspaces for marginalized individuals – which can benefit people in the workplace in general.

7.1 Balancing Form & Function: Play and Distraction in Mentorship and the Workplace

Our results indicate that Mentorship Garden and its rituals structured mentorship in the workplace, but could also potentially distract from mentorship practices. Though many participants enjoyed structure and play through the rituals, some struggled to follow the rituals and instead fixated on exploring or arranging objects rather than conversing. Participants’ views of play also differed: some liked the contrast with typical work activities while others felt it might not be appropriate in serious work settings. Based on prior research (including from CSCW), we argue that play has an important place at work, where social playfulness and gamification can support inspiration, innovation, creativity, self-efficacy, work performance, collaboration, learning, and well-being [11, 62, 70, 77, 121]. These are especially important for historically marginalized individuals, who face barriers in work and compounded stress due to oppressive systems across all contexts [90, 135]. The value of play alongside the tension we observed suggests the need to balance the form and function of mentorship VEs in the workplace, so that it can provide delight without running the risk of being distracting or seeming unprofessional.

One approach to balanced play could be providing more options for rituals that can adjust to differing mentoring styles. The play in Mentorship Garden primarily focused on conversation-oriented mentorship, encouraging conversation around important topics and preserving visual metaphors of progress. In practice, mentorship approaches extend beyond conversation as needed, e.g., applying learning-by-doing for key skills and tasks to uplift marginalized mentees [64]. Moreover, prior research suggests that mentors should develop individual-focused strategies to bolster the emotional well-being of their historically marginalized mentees, which would be a deeply personal and complex process unique to each relationship [113]. Thus, it is important to design VEs that are

not overly prescriptive and/or distracting, but can still foster valuable experiences for historically marginalized mentees (e.g., normalizing discussing emotions related to work). This might entail building customization options for metaphors that are personally meaningful or selection of rituals they find useful.

Additionally, briefer interactions, rather than multi-step rituals, could minimize distraction, while giving users the time to explore freely. Researchers might consider prior HCI work on lightweight, playful interventions in the workplace, such as digital sensors in physical space to promote group creativity [123], and “talking” seats in office environments to foster a playful and creative atmosphere [92]. From prior work in CSCW, *Mood Squeezer* engaged an entire building of employees without becoming an inconvenient distraction. Employees squeezed a colored ball to indicate their mood as they passed through a common area, and their input affected an ambient light display of the building’s collective moods. This interaction took only a few seconds and still brought delight and greater feelings of connection to others in the building [42].

Inspired by the brevity of *Mood Squeezer*, mentorship counterspace design might offload manual interactions to features like our chatbot, which could automatically make changes in the environment. For example, for a mood-oriented ritual, rather than requiring users to interact with mood directly (i.e., by watering a mood flower as in Mentorship Garden), the system can nudge pairs to talk about the mentee’s mood simply by changing the color of objects or the environment as a whole based on any input into the chatbot. This content could be further blended into the environment as a more subtle cue, such as a mood stone path that users could walk through, thus virtually and metaphorically walking through mentees’ feelings. These nudges could facilitate important conversations without requiring more action from pairs for those who find rituals distracting. Less ritualistic options for facilitating mentorship in the workplace could also offset cheesiness due to their greater subtlety. Future work should explore balance between the interactivity of rituals and the brevity of nudges to integrate different mentorship styles and needs in 3D VEs.

7.2 Digging Deeper: Supporting Historically Marginalized People in the Workplace

Our results reveal opportunities for how VEs can be safe spaces for marginalized groups in the workplace as counterspaces, for mentorship and other activities. Participants imagined several possibilities, including using the space for personal expression, connection, and allyship. We discuss future directions for exploring counterspace design that provides greater agency and ownership to marginalized groups in the workplace, as well as to strengthen allyship in the workplace.

7.2.1 Agency & Ownership in Virtual Counterspaces for ERGs. Like prior counterspace work [129], participants highlighted the importance of marginalized group agency and ownership of VEs meant to uplift them. Participants discussed this in the context of customizing appearance and related features, such as personalized 3D avatars. Prior HCI work has shown how 3D avatar design can indeed create space for identity expression for marginalized groups [41]. Building on this work, our results suggest the need to personalize VEs as a whole to enable identity and cultural expression for marginalized groups. Shaping the virtual space that they will share with each other can empower these groups to decide what their safety and comfort looks and feels like. For example, participants imagined virtual counterspaces for celebrating accomplishments and cultural events.

Future work could explore the potential for marginalized groups to become authors of immersive mentorship counterspaces. For example, prior CSCW work shows how marginalized groups can create counterspaces of enrichment and empowerment by authoring digital spaces, like subreddits [110]. As another digital space, the Mentorship Garden prompted participants to imagine how to customize the environment and rituals to reflect what they value and ways they wish to mutually develop their professional relationship together. Participants envisioned a more powerful chatbot

that could make changes by request (akin to generating AI art) or making changes in the virtual space themselves in real-time. This suggests a need for a wide range of customization options that support diverse prior experience with manipulating 3D VEs. 3D workplace VEs like the Mentorship Garden could thus function as a sandbox for marginalized groups to shape and cultivate culture that advocates for them within the workplace context.

7.2.2 Virtual Counterspaces for Allyship in the Workplace. Participants felt the design of Mentorship Garden could build connection and guide important, difficult group conversations, including for cultivating allyship in the workplace. Counterspaces are often heterogeneous [93] and include allies. Related work on *Stardew Valley* shows how games, conceptualized as a VE, could support solidarity and practicing new strategies for creating and sustaining community, such as learning allyship practices [26]. Prior research on games has also shown how playful interactions can facilitate receptivity to DEI conversations and transformative learning experiences [61].

Mentorship Garden similarly demonstrates potential for game-like, 3D VEs to foster comfort and become counterspaces for workplace allyship, where playfulness could facilitate important yet hard conversations about DEI at work. Mentorship Garden can be cultivated as a space where historically marginalized groups and allies can connect. For example, it could be a platform for ERG meetings, or even exploring new cultural strategies and ways of working together that are more equitable and just. Rituals could be group activities for better understanding the experiences of historically marginalized people at work and developing strategies for allyship. Future work could explore design of additional rituals to facilitate difficult allyship conversations. This should engage with prior CSCW work on fostering critical reflection and transformative learning that acknowledges discomfort around DEI topics (e.g., engaging with decolonization despite discomfort [46]). Additionally, boundaries and balance around the intersection of marginalized individuals' personal and professional lived experiences are important. These can be defined by the preferences, needs, and nature of mentors' and mentees' professions and workplace [125], and help them navigate sharing personal testimonies and push back against oppressive systems together.

8 Limitations

Our study results show how 3D VEs can support mentorship in the workplace. However, there are limitations in the current work. As an initial exploration, our research aims to spark future work around research opportunities that arise from these limitations.

First, this research was conducted within one institution, albeit a large global institution with hundreds of thousands of employees. Mentorship in the workplace, especially for marginalized individuals, may be experienced differently in other workplaces. These differences may stem from differing workplace cultures and mentorship perceptions and practices, as well as cultural differences across countries (our research was conducted solely in North America).

Second, our study design focused on interaction with the prototype during two sessions, targeting relationship building and progress check-ins. Future work should explore longer-term mentorship, as mentorship relationships may change over time and require new rituals and structures. Researchers may also consider comparing the long-term use of systems like Mentorship Garden to existing mentorship programs within organizations to better understand their impact.

Third, while we recruited diverse pairs across seniority levels, the mentorship relationships we focused on were limited. All pairs except 1 had been engaging in some form of mentorship prior to participation. Prior relationships might affect the way people interact during the rituals; thus, future work should consider exploring how new or early mentorship relationships might compare. Additionally, our study focused on mentorship in pairs. Future work should explore different types of mentorship (e.g., group, peer) and how immersive VEs might adjust to accommodate them. We

also faced challenges recruiting mentors higher in the organizational chart. Senior-level participants tended to have limited availability (e.g., Pair 9, for whom we were unable to schedule a second session). Thus, our results provide limited insight into how VEs like ours might apply to mentoring at the senior level, which might require considering different workdays and career goals.

Also, our study explored VEs for mentorship in the workplace accessed via web-browsers on computers. Future work could include exploring different platforms, including VR headsets, which could leverage embodied interaction, or AR devices that can integrate counterspace design and mentorship practices into the physical workplace. Their immersive nature could bolster the environment and rituals' effects on workplace mentorship perceptions, behaviors, and collaborations.

Finally, our prototype and rituals are visually-dominant experiences. Future work includes exploring different modalities for constructing VEs for more inclusive, accessible mentorship in the workplace, e.g. audio- or haptic-based interactions. We have begun further work addressing this limitation via a focus group with accessibility experts to explore how VEs can support accessible mentorship in the workplace for people with disabilities.

9 Conclusion

We present Mentorship Garden, a web-based 3D VE counterspace for mentorship in the workplace to uplift historically marginalized individuals. Based on findings from 3 design focus groups, we designed Mentorship Garden to be a relaxing outdoor environment for pairs to engage in rituals that guide mentorship discussions and build their relationship. We evaluated Mentorship Garden in a field study with 10 mentorship pairs who used the prototype in mentorship sessions during their workdays. Our qualitative analysis revealed that Mentorship Garden facilitated important mentorship conversations, fostered new kinds of workplace collaboration, and created mentorship counterspaces at work for employees, including workplace communities of historically marginalized people. Our findings also indicated that mentorship rituals can be potentially distracting and need to be carefully incorporated into work settings. We contribute a virtual mentorship counterspace prototype and rituals that structure mentorship, as well as insights and opportunities for further research on virtual counterspaces for empowering historically marginalized groups in the workplace via mentorship and beyond.

References

- [1] Dane Acena and Guo Freeman. 2021. "in my safe space": Social support for lgbtq users in social virtual reality. In *Extended abstracts of the 2021 CHI conference on human factors in computing systems*. 1–6.
- [2] Pooya Adami, Burcin Becerik-Gerber, Lucio Soibelman, Tenzin Doleck, Yasemin Copur-Gencturk, and Gale Lucas. 2020. An immersive virtual learning environment for worker-robot collaboration on construction sites. In *2020 Winter Simulation Conference (WSC)*. IEEE, 2400–2411.
- [3] Jamal-Jared Alexander. 2023. Centering the Marginalized: Creating a Coalition to Enhance Retention Initiatives in the Workplace. *Technical Communication* 70, 3 (2023), 28–41.
- [4] Tammy D Allen, Lillian T Eby, Mark L Poteet, Elizabeth Lentz, and Lizzette Lima. 2004. Career benefits associated with mentoring for protégés: A meta-analysis. *Journal of applied psychology* 89, 1 (2004), 127.
- [5] Alvin N Alvarez, Arthur W Blume, Joseph M Cervantes, and Lisa Rey Thomas. 2009. Tapping the wisdom tradition: Essential elements to mentoring students of color. *Professional Psychology: Research and Practice* 40, 2 (2009), 181.
- [6] Arthur Aron, Edward Melinat, Elaine N Aron, Robert Darrin Vallone, and Renee J Bator. 1997. The experimental generation of interpersonal closeness: A procedure and some preliminary findings. *Personality and social psychology bulletin* 23, 4 (1997), 363–377.
- [7] Karen Becker and Adelle Bish. 2021. A framework for understanding the role of unlearning in onboarding. *Human Resource Management Review* 31, 1 (2021), 100730.
- [8] Kevin Beltran, Cody Rowland, Nicki Hashemi, Anh Nguyen, Lane Harrison, Sophie Engle, and Beste F Yuksel. 2021. Reducing implicit gender bias using a virtual workplace environment. In *Extended abstracts of the 2021 CHI conference on human factors in computing systems*. 1–7.

- [9] Cecilia Bjursell and Rebecka Florin Sădbom. 2017. Mentorship programs for workplace inclusion and learning. *Adult Education for Inclusion and Diversity* (2017), 28.
- [10] Khalia Braswell, Simone Smarr, and Jamie Payton. 2023. Mirror Mentoring: Black Women's Experiences Serving as Mentors for Black Girls During a Virtual Computer Science Camp. *ACM Transactions on Computing Education* (2023).
- [11] Lonny J Brooks and Geoffrey Bowker. 2002. Playing at work: Understanding the future of work practices at the institute for the future. *Information, Communication & Society* 5, 1 (2002), 109–136.
- [12] John E Brough, Maxim Schwartz, Satyandra K Gupta, Davinder K Anand, Robert Kavetsky, and Ralph Pettersen. 2007. Towards the development of a virtual environment-based training system for mechanical assembly operations. *Virtual reality* 11 (2007), 189–206.
- [13] Cynthia E Brown. 2016. Ethical issues when graduate students act as mentors. *Ethics & Behavior* 26, 8 (2016), 688–702.
- [14] Nadia E Brown and Celeste Montoya. 2020. Intersectional mentorship: A model for empowerment and transformation. *PS: Political Science & Politics* 53, 4 (2020), 784–787.
- [15] Willie C Brown, Laura Magaña, Carlos J Crespo, and Wendy B White. 2021. Mentoring underrepresented minoritized students for success. 20S–22S pages.
- [16] David Byrne. 2022. A worked example of Braun and Clarke's approach to reflexive thematic analysis. *Quality & quantity* 56, 3 (2022), 1391–1412.
- [17] Jonathan Cabiria. 2008. Virtual world and real world permeability: Transference of positive benefits for marginalized gay and lesbian populations. *Journal For Virtual Worlds Research* 1, 1 (2008).
- [18] Jon Cabiria. 2011. Virtual worlds and identity exploration for marginalised people. In *Reinventing ourselves: Contemporary concepts of identity in virtual worlds*. Springer, 301–321.
- [19] Evan W Carr, Andrew Reece, Gabriella Rosen Kellerman, and Alexi Robichaux. 2019. The value of belonging at work. *Harvard business review* 16 (2019).
- [20] Angela D Carter and Stephanie Sisco. 2022. The hill we climb: The future of women of color leadership development. *Advances in developing human resources* 24, 3 (2022), 208–219.
- [21] Bettina J Casad, Danielle L Oyler, Erin T Sullivan, Erika M McClellan, Destiny N Tierney, Drake A Anderson, Paul A Greeley, Michael A Fague, and Brian J Flammang. 2018. Wise psychological interventions to improve gender and racial equality in STEM. *Group Processes & Intergroup Relations* 21, 5 (2018), 767–787.
- [22] Andrew D Case and Carla D Hunter. 2012. Counterspaces: A unit of analysis for understanding the role of settings in marginalized individuals' adaptive responses to oppression. *American journal of community psychology* 50 (2012), 257–270.
- [23] Ada T Cenkeci, Jeffrey M Zimmerman, and Tuba Bircan. 2019. The effects of employee resource groups on work engagement and workplace inclusion. *The International Journal of Organizational Diversity* 19, 2 (2019), 1.
- [24] Roberto K Champney, Kay M Stanney, Laura Milham, Meredith B Carroll, and Joseph V Cohn. 2017. An examination of virtual environment training fidelity on training effectiveness. *International Journal of Learning Technology* 12, 1 (2017), 42–65.
- [25] David Chodos, Lucio Gutierrez, and Eleni Stroulia. 2012. Creating healthcare training simulations in virtual worlds. In *2012 4th International Workshop on Software Engineering in Health Care (SEHC)*. IEEE, 58–64.
- [26] Erica Principe Cruz. 2022. Counterspace Game Elements for This Pansexual Pilipina American Player's Joy, Rest, and Healing: An Autoethnographic Case Study of Playing Stardew Valley. *gamevironments* 17 (2022), 40–40.
- [27] Sloan Davis, Audrey Rorrer, Cori Grainger, and Sepi Hejazi Moghadam. 2023. Equitable Student Persistence in Computing Research Through Distributed Career Mentorship. In *Proceedings of the 54th ACM Technical Symposium on Computer Science Education V. 1* (Toronto ON, Canada) (*SIGCSE 2023*). Association for Computing Machinery, New York, NY, USA, 94–100. doi:10.1145/3545945.3569789
- [28] G De Sensi, Francesco Longo, and Giovanni Mirabelli. 2007. Ergonomic and work methods optimization in a three dimensional virtual environment. In *Proceedings of the 2007 Summer Computer Simulation Conference*. 1187–1192.
- [29] Connie Deng and Nick Turner. 2024. Identifying key mentor characteristics for successful workplace mentoring relationships and programmes. *Personnel Review* 53, 2 (2024), 580–604.
- [30] Mats Deutschmann, Anders Steinvall, and Airong Wang. 2019. Participating on More Equal Terms? (2019).
- [31] Tawanna R. Dillahunt, Matthew Garvin, Marcy Held, and Julie Hui. 2021. Implications for Supporting Marginalized Job Seekers: Lessons from Employment Centers. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW2, Article 324 (oct 2021), 24 pages. doi:10.1145/3476065
- [32] Huong Q Dinh, Neff Walker, Larry F Hodges, Chang Song, and Akira Kobayashi. 1999. Evaluating the importance of multi-sensory input on memory and the sense of presence in virtual environments. In *Proceedings IEEE Virtual Reality (Cat. No. 99CB36316)*. IEEE, 222–228.
- [33] Helga Dorner, Gorana Misic, and Margaryta Rymarenko. 2021. Online mentoring for academic practice: strategies, implications, and innovations. *Annals of the New York Academy of Sciences* 1483, 1 (2021), 98–111.

- [34] Bryan Dosono. 2019. *Identity Work of Asian Americans and Pacific Islanders on Reddit: Traversals of Deliberation, Moderation, and Decolonization*. Ph. D. Dissertation. Syracuse University.
- [35] Bryan Dosono and Bryan Semaan. 2018. Identity work as deliberation: AAPI political discourse in the 2016 US Presidential Election. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*. 1–12.
- [36] Bryan Dosono and Bryan Semaan. 2020. Decolonizing tactics as collective resilience: Identity work of AAPI communities on Reddit. *Proceedings of the ACM on Human-Computer interaction* 4, CSCW1 (2020), 1–20.
- [37] Isabel Espinal, Anne Graham, Maria Rios, and Katherine Freedman. 2023. Counterspace Support for BIPOC Employees Within a Holistic JEDI Library Framework. In *Perspectives on Justice, Equity, Diversity, and Inclusion in Libraries*. IGI Global, 1–19.
- [38] Travis Faas, Lynn Dombrowski, Alyson Young, and Andrew D Miller. 2018. Watch me code: Programming mentorship communities on twitch. tv. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW (2018), 1–18.
- [39] Guo Freeman and Dane Acena. 2022. "Acting Out" Queer Identity: The Embodied Visibility in Social Virtual Reality. *Proceedings of the ACM on Human-Computer Interaction* 6, CSCW2 (2022), 1–32.
- [40] Guo Freeman, Dane Acena, Nathan J McNeese, and Kelsea Schulenberg. 2022. Working together apart through embodiment: Engaging in everyday collaborative activities in social Virtual Reality. *Proceedings of the ACM on Human-Computer Interaction* 6, GROUP (2022), 1–25.
- [41] Guo Freeman, Divine Maloney, Dane Acena, and Catherine Barwulor. 2022. (Re) discovering the physical body online: Strategies and challenges to approach non-cisgender identity in social Virtual Reality. In *Proceedings of the 2022 CHI conference on human factors in computing systems*. 1–15.
- [42] Sarah Gallacher, Jenny O'Connor, Jon Bird, Yvonne Rogers, Licia Capra, Daniel Harrison, and Paul Marshall. 2015. Mood squeezer: lightening up the workplace through playful and lightweight interactions. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*. 891–902.
- [43] Danilo Gasques, Janet G. Johnson, Tommy Sharkey, Yuanyuan Feng, Ru Wang, Zhuoqun Robin Xu, Enrique Zavala, Yifei Zhang, Wanze Xie, Xinming Zhang, Konrad Davis, Michael Yip, and Nadir Weibel. 2021. ARTEMIS: A Collaborative Mixed-Reality System for Immersive Surgical Telementoring. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems (Yokohama, Japan) (CHI '21)*. Association for Computing Machinery, New York, NY, USA, Article 662, 14 pages. doi:10.1145/3411764.3445576
- [44] Tyler McCoy Gay, Oluyemi TO Farinu, and Monisha Issano Jackson. 2022. "From all sides": Black-Asian Reddit communities identify and expand experiences of the multiracial microaggression taxonomy. *Social Sciences* 11, 4 (2022), 168.
- [45] Daniel Gillette. 2008. Developing a multi-user virtual environment for adolescent psychotherapy. In *Proceedings of the 7th international conference on Interaction design and children*. 57–60.
- [46] Helen Halbert and Lisa P Nathan. 2015. Designing for discomfort: Supporting critical reflection through interactive tools. In *Proceedings of the 18th ACM conference on computer supported cooperative work & social computing*. 349–360.
- [47] Jessica Hammer, Alexandra To, and Erica Principe Cruz. 2020. Lab Counterculture. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems (Honolulu, HI, USA) (CHI EA '20)*. Association for Computing Machinery, New York, NY, USA, 1–14. doi:10.1145/3334480.3381824
- [48] Catherine A Hansman. 2002. Diversity and power in mentoring relationships. *Critical perspectives on mentoring: Trends and issues* (2002), 39–48.
- [49] Ashley Hardin and Samantha Brooks. 2021. Pivoting to Virtual: Recommendations for a Successful and Engaging Digital Mentorship Experience. In *Proceedings of the 39th ACM International Conference on Design of Communication*. 351–353.
- [50] Peter Heinrich, Mehmet Kilic, Felix-Robinson Aschoff, and Gerhard Schwabe. 2014. Enabling relationship building in tabletop-supported advisory settings. In *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing (Baltimore, Maryland, USA) (CSCW '14)*. Association for Computing Machinery, New York, NY, USA, 171–183. doi:10.1145/2531602.2531697
- [51] William LeRoy Heinrichs, Patricia Youngblood, Phillip M Harter, and Parvati Dev. 2008. Simulation for team training and assessment: case studies of online training with virtual worlds. *World journal of surgery* 32 (2008), 161–170.
- [52] Linda Hershkovitz. 1993. Tiananmen Square and the politics of place. *Political Geography* 12, 5 (1993), 395–420.
- [53] Sylvia Ann Hewlett and Kennedy Ihezue. 2022. 20% of White employees have sponsors. Only 5% of Black employees do. *Harvard Business Review. Published February 10* (2022).
- [54] Tristram Hooley, Jo Hutchinson, and Siobhan Neary. 2016. Ensuring quality in online career mentoring. *British Journal of Guidance & Counselling* 44, 1 (2016), 26–41.
- [55] Karen Hopkins, Megan Meyer, Jenny Afkinich, Eva Bialobrzewski, Venessa Perry, and Joseph Brown. 2022. Facilitated peer coaching among women human service professionals: Leadership learning, application and lessons learned. *Human Service Organizations: Management, Leadership & Governance* 46, 3 (2022), 184–201.

- [56] Julie Hui, Elizabeth M. Gerber, Lynn Dombrowski, Mary L. Gray, Adam Marcus, and Niloufar Salehi. 2018. Computer-Supported Career Development in The Future of Work. In *Companion of the 2018 ACM Conference on Computer Supported Cooperative Work and Social Computing* (, Jersey City, NJ, USA,) (CSCW '18 Companion). Association for Computing Machinery, New York, NY, USA, 133–136. doi:10.1145/3272973.3274545
- [57] Marcus Anthony Hunter, Mary Pattillo, Zandria F Robinson, and Keeanga-Yamahtta Taylor. 2016. Black placemaking: Celebration, play, and poetry. *Theory, Culture & Society* 33, 7-8 (2016), 31–56.
- [58] Pamela Irazú Ramírez Ibarra and Adriana Martínez Martínez. 2024. Unveiling Power Dynamics: Diversity Interpretations, Management Practices, and Inclusion Perceptions in the Workplace. *Nova Scientia* 16, 32 (2024), 1–18.
- [59] Maya Israel, Margaret L Kamman, Erica D McCray, and Paul T Sindelar. 2014. Mentoring in action: The interplay among professional assistance, emotional support, and evaluation. *Exceptional Children* 81, 1 (2014), 45–63.
- [60] Gary W Ivey and Kathryn E Dupré. 2022. Workplace mentorship: A critical review. *Journal of Career Development* 49, 3 (2022), 714–729.
- [61] Geoff Kaufman and Mary Flanagan. 2015. A psychologically “embedded” approach to designing games for prosocial causes. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace* 9, 3 (2015).
- [62] Doris Kiendl, Sabrina Sorko, and Helene Stainer. 2024. The future workplace: Boosting human connectivity in a rapidly transforming work environment. In *1st European Dual Higher Education Conference, 10-11 April 2024, Paola, Malta*. 117–121.
- [63] Tiffany Knearem, Xiyang Wang, and John M Carroll. 2019. How professionals support amateurs’ creativity within the brewing community. In *Companion Publication of the 2019 Conference on Computer Supported Cooperative Work and Social Computing*. 252–256.
- [64] Benjamin R Knoll. 2016. Learning by doing: Mentoring group-based undergraduate research projects in an upper-level political science course. *PS: Political Science & Politics* 49, 1 (2016), 128–131.
- [65] Benjamin Koehne, Patrick C. Shih, and Judith S. Olson. 2012. Remote and alone: coping with being the remote member on the team. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work* (, Seattle, Washington, USA,) (CSCW '12). Association for Computing Machinery, New York, NY, USA, 1257–1266. doi:10.1145/2145204.2145393
- [66] Thomas Köllen. 2014. A review of minority stress related to employees’ demographics and the development of an intersectional framework for their coping strategies in the workplace. *The role of demographics in occupational stress and well being* (2014), 41–82.
- [67] Dongho Koo, Tania (Tee) C. O’Neill, Salih Berk Dinçer, Hin Kwan (Billy) Kwok, and Felicia Renelus. 2022. Immersive Emotions: Translating Emotions Into Visualization (*MobileHCI '22*). Association for Computing Machinery, New York, NY, USA, Article 7, 4 pages. doi:10.1145/3528575.3551430
- [68] Yubo Kou and Colin M Gray. 2018. "What do you recommend a complete beginner like me to practice?" Professional Self-Disclosure in an Online Community. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW (2018), 1–24.
- [69] Long W Lam and Dora C Lau. 2012. Feeling lonely at work: investigating the consequences of unsatisfactory workplace relationships. *The International Journal of Human Resource Management* 23, 20 (2012), 4265–4282.
- [70] Kiersten F Latham and Brenda Cowan. 2023. Delight as Flourishing. In *Flourishing in Museums*. Routledge, 195–201.
- [71] Christopher A. Le Dantec and Sarah Fox. 2015. Strangers at the Gate: Gaining Access, Building Rapport, and Co-Constructing Community-Based Research. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing* (Vancouver, BC, Canada) (CSCW '15). Association for Computing Machinery, New York, NY, USA, 1348–1358. doi:10.1145/2675133.2675147
- [72] Elizabeth M Lee and Jacob Harris. 2020. Counterspaces, Counterstructures: Low-Income, First-Generation, And Working-Class Students’ Peer Support At Selective Colleges 1. In *Sociological forum*, Vol. 35. Wiley Online Library, 1135–1156.
- [73] Henri Lefebvre. 2012. From the production of space. In *Theatre and Performance Design*. Routledge, 81–84.
- [74] Andreas PD Liefvooghe and KateKenzie Mac Davey. 2001. Accounts of workplace bullying: The role of the organization. *European Journal of work and organizational psychology* 10, 4 (2001), 375–392.
- [75] Doo Hun Lim, Soo Jeoung Han, Jihye Oh, and Chang Sung Jang. 2019. Application of virtual and augmented reality for training and mentoring of higher education instructors. In *Handbook of research on virtual training and mentoring of online instructors*. IGI Global, 325–344.
- [76] Sin-Ning C Liu, Stephanie EV Brown, and Isaac E Sabat. 2019. Patching the “leaky pipeline”: Interventions for women of color faculty in STEM academia. *Archives of Scientific Psychology* 7, 1 (2019), 32.
- [77] Ziyi Liu, Ling Yuan, Chengcheng Cao, Ye Yang, and Fanchao Zhuo. 2024. How playfulness climate promotes the performance of millennial employees—the mediating role of change self-efficacy. *Journal of Organizational Change Management* (2024).

- [78] Joanne Lloyd, Nathan V Persaud, and Theresa E Powell. 2009. Equivalence of real-world and virtual-reality route learning: A pilot study. *Cyberpsychology & Behavior* 12, 4 (2009), 423–427.
- [79] Michelle R Madore and Desiree Byrd. 2022. Optimizing mentoring relationships with persons from historically marginalized communities through the use of difficult dialogues. *Journal of Clinical and Experimental Neuropsychology* 44, 5-6 (2022), 441–449.
- [80] Lisa Mainiero. 2020. Workplace romance versus sexual harassment: A call to action regarding sexual hubris and exploitation in the #MeToo era. *Gender in Management: An International Journal* 35, 4 (2020), 329–347.
- [81] Jennifer Marlow and Laura Dabbish. 2014. From rookie to all-star: professional development in a graphic design social networking site. In *Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing*. 922–933.
- [82] Kevin S McClain and April Perry. 2017. Where did they go: Retention rates for students of color at predominantly white institutions. (2017).
- [83] Chris Michalak and Marlette Jackson. 2022. Supporting the Well-Being of Your Underrepresented Employees. <https://hbr.org/2022/03/supporting-the-well-being-of-your-underrepresented-employees>. (Accessed on 05/16/2023).
- [84] Tyler Miller, Jung-Han Kimn, and Stephen P. Gent. 2019. Holistic Summer Undergraduate Research Program in High Performance Computing Research. In *Proceedings of the Practice and Experience in Advanced Research Computing on Rise of the Machines (Learning)* (Chicago, IL, USA) (PEARC '19). Association for Computing Machinery, New York, NY, USA, Article 82, 7 pages. doi:10.1145/3332186.3332215
- [85] Krista Lynn Minnotte and Elizabeth M Legerski. 2019. Sexual harassment in contemporary workplaces: Contextualizing structural vulnerabilities. *Sociology Compass* 13, 12 (2019), e12755.
- [86] Joi-Lynn Mondisa, Becky Wai-Ling Packard, and Beronda L Montgomery. 2021. Understanding what STEM mentoring ecosystems need to thrive: A STEM-ME framework. *Mentoring & Tutoring: Partnership in Learning* 29, 1 (2021), 110–135.
- [87] Johannes Moskaliuk, Johanna Bertram, and Ulrike Cress. 2013. Impact of virtual training environments on the acquisition and transfer of knowledge. *Cyberpsychology, Behavior, and Social Networking* 16, 3 (2013), 210–214.
- [88] Johannes Moskaliuk, Johanna Bertram, and Ulrike Cress. 2013. Training in virtual environments: putting theory into practice. *Ergonomics* 56, 2 (2013), 195–204.
- [89] Carol A Mullen and Cindy C Klimaitis. 2021. Defining mentoring: a literature review of issues, types, and applications. *Annals of the New York Academy of Sciences* 1483, 1 (2021), 19–35.
- [90] Kevin L Nadal, Rukiya King, DR Gina Sissoko, Nadia Floyd, and DeCarlos Hines. 2021. The legacies of systemic and internalized oppression: Experiences of microaggressions, imposter phenomenon, and stereotype threat on historically marginalized groups. *New Ideas in Psychology* 63 (2021), 100895.
- [91] Tomi Nukarinen, Howell O. Istance, Jussi Rantala, John Mäkelä, Kalevi Korpela, Kimmo Ronkainen, Veikko Surakka, and Roope Raisamo. 2020. Physiological and Psychological Restoration in Matched Real and Virtual Natural Environments. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) (CHI EA '20). Association for Computing Machinery, New York, NY, USA, 1–8. doi:10.1145/3334480.3382956
- [92] Timo Nummenmaa, Annakaisa Kultima, Heikki Tyni, and Kati Alha. 2014. MurMur Moderators, the Talking Playful Seats. In *Proceedings of the 18th International Academic MindTrek Conference: Media Business, Management, Content & Services* (Tampere, Finland) (AcademicMindTrek '14). Association for Computing Machinery, New York, NY, USA, 231–237. doi:10.1145/2676467.2676505
- [93] Maria Ong, Janet M Smith, and Lily T Ko. 2018. Counterspaces for women of color in STEM higher education: Marginal and central spaces for persistence and success. *Journal of research in science teaching* 55, 2 (2018), 206–245.
- [94] Jose Ortiz, Amber Young, Michael Myers, Rudolph T Bedeley, Donal Carbaugh, Hameed Chughtai, Elizabeth Davidson, Jordana George, Janis Gogan, Steven Gordon, et al. 2019. Giving voice to the voiceless: The use of digital technologies by marginalized groups. (2019).
- [95] Jason A Ortiz and Carolina Cruz-Neira. 2023. Workspace VR: A Social and Collaborative Telework Virtual Reality Application. In *Companion Publication of the 2023 Conference on Computer Supported Cooperative Work and Social Computing*. 381–383.
- [96] D Kevin O'Neill*, Mark Weiler, and Li Sha. 2005. Software support for online mentoring programs: A research-inspired design. *Mentoring & Tutoring: Partnership in Learning* 13, 1 (2005), 109–131.
- [97] Elizabeth Page-Gould, Rodolfo Mendoza-Denton, and Linda R Tropp. 2008. With a little help from my cross-group friend: Reducing anxiety in intergroup contexts through cross-group friendship. *Journal of personality and social psychology* 95, 5 (2008), 1080.
- [98] Douglas L Paterson. 1994. A Role to Play for the Theatre of the Oppressed. *TDR (1988-)* 38, 3 (1994), 37–49.
- [99] Francisco Perales. 2022. Improving the wellbeing of LGBTQ+ employees: Do workplace diversity training and ally networks make a difference? *Preventive Medicine* 161 (2022), 107113.

- [100] Emily January Petersen. 2019. The “reasonably bright girls”: Accessing agency in the technical communication workplace through interactional power. *Technical Communication Quarterly* 28, 1 (2019), 21–38.
- [101] Brian N Phillips, Jon Deiches, Blaise Morrison, Fong Chan, and Jill L Bezyak. 2016. Disability diversity training in the workplace: Systematic review and future directions. *Journal of occupational rehabilitation* 26 (2016), 264–275.
- [102] Belle Rose Ragins. 2007. Diversity and workplace mentoring relationships: A review and positive social capital approach. *The Blackwell handbook of mentoring: A multiple perspectives approach* (2007), 281–300.
- [103] Belle Rose Ragins and Kathy E Kram. 2007. *The handbook of mentoring at work: Theory, research, and practice*. Sage Publications.
- [104] Courtney N Reed, Paul Strohmeier, and Andrew P McPherson. 2023. Negotiating Experience and Communicating Information Through Abstract Metaphor. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–16.
- [105] Anke Verena Reinschluessel, Thomas Muender, Roland Fischer, Valentin Kraft, Verena Nicole Uslar, Dirk Weyhe, Andrea Schenk, Gabriel Zachmann, Tanja Döring, and Rainer Malaka. 2023. Versatile Immersive Virtual and Augmented Tangible OR – Using VR, AR and Tangibles to Support Surgical Practice. In *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) (CHI EA ’23). Association for Computing Machinery, New York, NY, USA, Article 477, 5 pages. doi:10.1145/3544549.3583895
- [106] Elizabeth D Rouse. 2020. Where you end and I begin: Understanding intimate co-creation. *Academy of Management Review* 45, 1 (2020), 181–204.
- [107] Ann Russell and Kirk Perris. 2003. Telementoring in community nursing: a shift from dyadic to communal models of learning and professional development. *Mentoring and Tutoring* 11, 2 (2003), 227–238.
- [108] Abdul-Manan Sadick and Imriyas Kamardeen. 2020. Enhancing employees’ performance and well-being with nature exposure embedded office workplace design. *Journal of Building Engineering* 32 (2020), 101789.
- [109] Ma Carolina Saffie-Robertson. 2020. It’s not you, it’s me: An exploration of mentoring experiences for women in STEM. *Sex Roles* 83, 9-10 (2020), 566–579.
- [110] Subhasree Sengupta. 2022. Envisioning Digital Sanctuaries: An Exploration of Virtual Collectives for Nurturing Professional Development of Women in Technical Domains. In *Companion Publication of the 2022 Conference on Computer Supported Cooperative Work and Social Computing*. 251–254.
- [111] Subhasree Sengupta and Bryan Semaan. 2021. ‘A Guiding Light in a Virtual Haven’: A Preliminary Analysis of Conversations Around Navigating and Repairing Self-worth in an Online Professional Community for Women. In *Companion Publication of the 2021 Conference on Computer Supported Cooperative Work and Social Computing* (Virtual Event, USA) (CSCW ’21 Companion). Association for Computing Machinery, New York, NY, USA, 158–162. doi:10.1145/3462204.3481737
- [112] Carmit-Noa Shpigelman and Carol J Gill. 2013. The characteristics of unsuccessful e-mentoring relationships for youth with disabilities. *Qualitative Health Research* 23, 4 (2013), 463–475.
- [113] Haysetta Shuler, Victor Cazares, Andrea Marshall, Edgar Garza-Lopez, Rainbo Hultman, Tam’ra-Kay Francis, Tiffany Rolle, Mariana X Byndloss, Chrystal A Starbird, Innes Hicasmaz, et al. 2021. Intentional mentoring: maximizing the impact of underrepresented future scientists in the 21st century. *Pathogens and Disease* 79, 6 (2021), ftab038.
- [114] Karina Silva, Ana-Paula Correia, and Cristina Pardo-Ballester. 2010. A faculty mentoring experience: Learning together in Second Life. *Journal of Computing in Teacher Education* 26, 4 (2010), 149–159.
- [115] Rafael M. L. Silva, Erica Principe Cruz, Daniela K. Rosner, Dayton Kelly, Andrés Monroy-Hernández, and Fannie Liu. 2022. Understanding AR Activism: An Interview Study with Creators of Augmented Reality Experiences for Social Change. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) (CHI ’22). Association for Computing Machinery, New York, NY, USA, Article 630, 15 pages. doi:10.1145/3491102.3517605
- [116] John Scott Siri Jr, Hamna Khalid, Luong Nguyen, and Donghee Yvette Wohn. 2018. Screen-viewing Practices in Social Virtual Reality. In *Companion of the 2018 ACM Conference on Computer Supported Cooperative Work and Social Computing*. 173–176.
- [117] Stephanie Sisco. 2020. Race-conscious career development: Exploring self-preservation and coping strategies of Black professionals in corporate America. *Advances in Developing Human Resources* 22, 4 (2020), 419–436.
- [118] Karen Skardzius. 2015. Playing with Pride: Marginalized Players Claiming Space Through Community Building and Equity Enforcement in World of Warcraft. *Queen’s University* (2015).
- [119] Iain A Smith and Amanda Griffiths. 2022. Microaggressions, everyday discrimination, workplace incivilities, and other subtle slights at work: A meta-synthesis. *Human Resource Development Review* 21, 3 (2022), 275–299.
- [120] Gayle Souter-Brown, Erica Hinckson, and Scott Duncan. 2021. Effects of a sensory garden on workplace wellbeing: A randomised control trial. *Landscape and Urban Planning* 207 (2021), 103997.
- [121] Laurentiu Catalin Stanculescu, Alessandro Bozzon, Robert-Jan Sips, and Geert-Jan Houben. 2016. Work and play: An experiment in enterprise gamification. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*. 346–358.

- [122] Donald Sull, Charles Sull, William Cipolli, and Caio Brighenti. 2022. Why every leader needs to worry about toxic culture. *MIT Sloan Management Review* (2022).
- [123] Lisa M. Tolentino, Aisling Kelliher, David A. Birchfield, and Rebecca P. Stern. 2008. Creativity Interventions: Physical-Digital Activities for Promoting Group Creativity. In *CHI '08 Extended Abstracts on Human Factors in Computing Systems* (Florence, Italy) (CHI EA '08). Association for Computing Machinery, New York, NY, USA, 2841–2846. doi:10.1145/1358628.1358771
- [124] Maria Tomprou, Laura Dabbish, Robert E. Kraut, and Fannie Liu. 2019. Career Mentoring in Online Communities: Seeking and Receiving Advice from an Online Community. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) (CHI '19). Association for Computing Machinery, New York, NY, USA, 1–12. doi:10.1145/3290605.3300883
- [125] Marianna Tu and Michael Li. 2021. What great mentorship looks like in a hybrid workplace. *Harvard Business Review* (2021).
- [126] Yi-Fu Tuan. 1977. *Space and place: The perspective of experience*. U of Minnesota Press.
- [127] Steven Warburton. 2009. Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching. *British journal of educational technology* 40, 3 (2009), 414–426.
- [128] Nadir Weibel, Danilo Gasques, Janet Johnson, Thomas Sharkey, Zhuoqun Robin Xu, Xinming Zhang, Enrique Zavala, Michael Yip, and Konrad Davis. 2020. ARTEMIS: Mixed-Reality Environment for Immersive Surgical Telementoring. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems* (, Honolulu, HI, USA.) (CHI EA '20). Association for Computing Machinery, New York, NY, USA, 1–4. doi:10.1145/3334480.3383169
- [129] Nicole M West. 2017. Withstanding our status as outsiders-within: Professional counterspaces for African American women student affairs administrators. *NASPA Journal About Women in Higher Education* 10, 3 (2017), 281–300.
- [130] Nicole M West. 2019. By us, for us: The impact of a professional counterspace on African American women in student affairs. *Journal of Negro Education* 88, 2 (2019), 159–180.
- [131] Stephanie M Wildman. 2000. » Privilege in the Workplace. *The Missing Element in Antidiscrimination Law.*« In: Juan F. Perea, Richard Delgado, Angela P. Harris & Stephanie M. Wildman: *Race and Races. Cases and Resources for a Diverse America*. St Paul, Minn.: West Group (2000), 534–535.
- [132] Peter Keough Williams. 2018. *An Analysis of the Ethnographic Significance of the Inupiaq Video Game Never Alone (Kisima Ingitchuna)*. Ph. D. Dissertation. The Florida State University.
- [133] Chi-Lan Yang. 2021. Understanding and reducing perception gaps with mediated social cues when building workplace relationships through cmc. In *Companion Publication of the 2021 Conference on Computer Supported Cooperative Work and Social Computing*. 303–306.
- [134] Ye Yuan. 2021. Support Social Connectedness through Technology-mediated Shared Activities. In *Companion Publication of the 2021 Conference on Computer Supported Cooperative Work and Social Computing* (Virtual Event, USA) (CSCW '21 Companion). Association for Computing Machinery, New York, NY, USA, 307–309. doi:10.1145/3462204.3481801
- [135] Ruth Enid Zambrana, R Burciaga Valdez, Chavella T Pittman, Todd Bartko, Lynn Weber, and Deborah Parra-Medina. 2021. Workplace stress and discrimination effects on the physical and depressive symptoms of underrepresented minority faculty. *Stress and Health* 37, 1 (2021), 175–185.
- [136] Gu Zhenjing, Supat Chupradit, Kuo Yen Ku, Abdelmohsen A Nassani, and Mohamed Haffar. 2022. Impact of employees' workplace environment on employees' performance: a multi-mediation model. *Frontiers in public health* 10 (2022), 890400.

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