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Surveying the Effects of Remote Communication & Collaboration Practices on Game Developers Amid a Pandemic

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ABSTRACT
Communication and collaboration are essential parts of the game development process. However, during the global pandemic, the shift to remote work marked a sudden change in how developers could communicate and collaborate with one another, as usual ad-hoc conversations that happen in physical offices were nonexistent. Based on a partnership grant study with the International Game Developers Association (IGDA), this piece focuses on the results of a survey that examined developers' mental health and productivity during the COVID-19 pandemic. Our findings suggest that most game developers want a hybrid or fully remote position even after pandemic conditions subside. Failure to address the pandemic’s impact on the game development industry risks ignoring a rich area of technical communication complicated by, and responsive to, hybrid workplaces.

INTRODUCTION
In “Game Design Documentation: Four Perspectives from Independent Game Studios,” Colby and Colby (2019) questioned how game design decisions are “made, communicated, and made manifest in the games produced from small to medium-sized studios” (p. 3). Prior to the COVID-19 pandemic, many game developers worked in fast-paced office environments that facilitated face-to-face technical communication and collaboration. They echoed what game developer John Whitmore told Colby and Colby (2019): “If everyone on the team knows where the designer is sitting, and you can go and talk to [him or her] whenever you run into a future question, [light documentation] works pretty easy” (p. 8). However, in recent years, game developers have found themselves isolated individuals who are reliant on quality webcams, stable Internet, patient loved ones, and bosses tasked with laying off staff or canceling projects altogether (Informa Tech, 2020). Those who were forced to work remotely joined peers who had been working remotely years before the pandemic. As one experienced game developer told us, “I've been working from home since 2015 - so in my particular case the pandemic actually improved communication (everyone learned how to do it).”

Amid current pandemic conditions, much game development is based on a confluence of remote production practices, from communicating on platforms that connect developers across time zones and continents, to sharing text and media-rich files in collaborative spaces (e.g., Google Docs, Trello). Remote communication and collaboration have put enormous pressure on game developers, particularly affecting women, transgender and nonbinary developers working in a male-dominated industry (Weststar & Legault, 2018). Still, as we begin returning to physical workspaces in 2022, many developers across demographics want a hybrid or remote position, despite its potential and documented effects on mental health and productivity. Ultimately, we argue that a failure to address the pandemic’s impact on the game development industry risks ignoring a rich area of technical communication complicated by, and responsive to, hybrid workplaces.
Advancing this line of argument, this article focuses on the results of a mixed-methods study that asked game developers about remote communication and collaboration. This survey was developed and distributed by a research team at York University and the International Game Developers Association (IGDA), the industry’s largest non-profit membership organization serving approximately 10,000 individuals who create games, with a mission to support and empower game developers around the world in achieving fulfilling and sustainable careers—including during these very challenging times. Initially, the overall goal of our study with the IGDA was to assess the impact of COVID-19 on the production practices of game developers, including how they have had to modify their communication methods to compensate for working remotely. The second goal was to identify and share any remote solutions and adaptations implemented by game developers that have proved useful to their professional needs. As the pandemic worsened and global lockdowns persisted, however, we realized we couldn’t elide questions about our participants’ mental health because it was a common thread among reports about the industry’s productivity. As Crevoshay (IGDA, 2020), executive director of the mental health support non-profit organization Take This, pointed out in the Game Development Crisis Conference in April 2020, “crises can be hard on mental health and it doesn’t exist in a vacuum. This is a tough time, and it’s a time when we need to pay more attention to mental health to ensure that we’re doing all right and able to show up in the way we need to at our jobs” (“GDCC Keynote - Mental Health During Crises - Game Development Crisis Conference”). Sentiments revolving around isolation, caring for families, and losing jobs have helped explain why developers have felt less productive.

To understand what myriad game developers have been feeling during these tough times while working (or not), a mixed-methods study that began with a brief but focused survey on mental health, communication and collaboration was necessary. Put differently, our survey phase was the first step toward understanding remote communication and collaboration practices that game developers adopted since the pandemic took hold of the world.

COVID-19 indeed hastened the onset of remote work and the need to gather data on the onset. Our study with the IGDA is significant to technical and professional communication (TPC) researchers and publics because it addresses one of North America and the world’s most lucrative creative industries (Smith, 2020; Taylor, 2019), and previous research suggests that technical communication is a cornerstone of successful game development (e.g., Colby & Colby, 2019; deWinter & Moeller, 2014). Never have game developers faced a global pandemic, and based on our findings, it seems likely that their production practices will never be the same.

This article begins with a review of the scholarship that animated our study: game design, technical communication in game design, and remote collaboration in game design. After describing our methods, we highlight the results of our survey and contextualize those results with interview commentary from game developers since summer 2021. Remote communication and collaboration tools are expected to be deeply embedded in the game development industry’s social, cultural, and intellectual futures. Our project, then, is significant because it augments IGDA’s organizational mission and anticipates such futures, conducting mixed-methods research to understand the best practices and pitfalls of remote communication and collaboration.

LITERATURE REVIEW: NEW EXIGENCES FOR STUDYING GAME DEVELOPMENT & TECHNICAL COMMUNICATION

Game development functions as a space for communication and creates opportunities for creative collaboration among members. According to deWinter and Moeller (2014), “games provide frameworks for interaction, and exist within complex cultural and economic structures that influence game creation, consumption, and deployment” (p. 8). As games represent technical and symbolic worlds that reflect our socio-cultural practices (deWinter & Vie, 2016, p. 152), game developers have to design complex “systems of experience” (deWinter & Moeller, 2014, p. 8) for interactions with game audiences (Tekinbasi & Zimmerman, 2003), and “explore relationships between audiences and interactive texts” (McDaniel & Daer, 2016, p. 157). Designing such complex systems involves a mosaic of tasks including “world design, system design, content design, game writing, level design, and user interface (UI) design” (p. 156–157). Therefore, the development of video games requires “challenging production scenarios” (McDaniel & Daer, 2016, p. 156–157; see also Greene & Palmer, 2011) that involves many collaborators from interdisciplinary, cultural, and geographical backgrounds (Czauderna & Guardiola, 2021, p. 1). Clearly, game development forces collaboration and communication between developers from different professional domains that range from creative directors, artists, and writers to domain experts such as scientists and user interface designers (O’Donnell, 2009; Tran & Biddle, 2008, p. 49).

Furthermore, Tran and Biddle (2008) argued that the complexity of game development makes it more likely that developers experience problems with communication and politics (p. 49). O’Donnell (2009) contended that collaboration often breaks because of such complexity, a complexity that is hard to generalize because no two games or development studios are the same. As such, development carries tensions in relation to strategies and methods of effective collaboration between multidisciplinary teams of developers (Tran & Biddle, 2009, p. 3). For O’Donnell, development “is about the assembly of a space where creative collaboration can occur. Any commitment to a single person’s ego, approach, or perspective will only end in disaster” (p. 70). Recent game studies scholarship has amplified such claims by turning to tensions and challenges faced by women and marginalized developers trying to navigate a global, male-dominated industry (Bailey et al., 2021; Helper, 2019; Kerr, 2021; Westar & Legault, 2018). Harvey’s (2021) study of games programs in higher education underscored the coping strategies of cis and trans women participants, including isolating themselves from social events and obscuring their identities. “This [latter] approach hinders some trans students in their transitioning, and several women in these courses indicated that tolerance for sexism, transphobia, and misogyny were key to their success in the field” (p. 10). In sum, this recent scholarship is useful for stressing that the stakes of collaborative game development are higher for developers who do not identify as white, straight, and male. In response to prior studies, our intervention draws on a technical communication lens to understand such stakes of collaborative development in a world relegated to screens.

Owing to the importance and complexity in communication and collaboration between game developers, technical communication is incorporated into multiple levels of game development
including design, production, distribution, and consumption of the technical medium (deWinter & Moeller, 2014, p. 8). In game development contexts, technical communication refers to channels of professional collaboration between developers in game design. According to Mason (2013), the intersection of technical communication and game development materializes in areas of design, information management, and systems of development. Previous literature on technical communication between developers (Daer, 2010; McAllister, 2004; O’Donnell, 2009; Robinson, 2008) has been “concerned with understanding humanistic interests and agencies among technical processes” (deWinter & Moeller, 2014, p. 6) including game development in relation to writing and design practices in hybrid and interdisciplinary teams of development. Furthermore, according to McDaniel and Daer (2016), previous scholarship has engaged with spaces of interaction between developers focusing on how they communicate, function, and solve complex problems through the use of technical documents and strategies in fast-paced workplace environments (p. 157; see also deWinter & Vie, 2016; Spinuzzi, 2008). More recent researchers in technical communication such as Finseth (2019), Karabinus and Atherton (2019), and Thominet (2020) have widened the scope of developer-focused studies to include user-participant audiences. Though our study didn’t question the role of public participation in game development amid COVID-19, it is a question worth exploring in a future study, for publics are “actively contributing to development in some way” through conversational and formal communication channels (p. 11).

In sum, the aforementioned studies stress the relationship between technical communication and game studies, and how games and game development can be viewed and studied through the lens of technical communication (McDaniel & Daer, 2016, pp. 156-157). However, scholarship on remote collaboration strategies between game developers, their day-to-day interactions, and decision-making practices are relatively opaque. The work environments for game developers can be characterized by what Spinuzzi (2015) called “all edge adhocracies,” or organizations that give workers complete flexibility, freedom, and control to organize and build projects in the manner that fits them best. To create flexibility, game developers have employed computers and computer software applications as an effective communication and collaboration channel (Tran & Biddle, 2009, pp. 3-4). Furthermore, game development companies have “always flirted with remote work, especially since the 1970’s” (Leonardi, 2020, p. 249), and the video game industry has incorporated remote work with even more regularity. As the work necessitates multiple professionals from multiple sites in different countries, freelancing developers have contributed to the industry for a long time.

When on-site communication becomes difficult, workers are given the flexibility to collaborate using remote strategies that provide the most affordances. However, the development and deployment of digital applications and channels of communication in the gaming and other creative industries has, in some ways, redefined, and other ways, amplified the challenges in relation to developer collaboration (Czauderna & Guardiola 2021, p.1; Tran & Biddle, 2009, p. 4). According to Czauderna and Guardiola (2021), remote collaboration requires a particular set of skills to manage communication workflow, and the “psychosocial challenges of working remotely over several time zones cannot be underestimated” (Olson & Olson, 2000, p. 1). Although remote work has been an important aspect of game development in recent years, there are significant gaps in previous scholarship in relation to remote work as a form of technical communication. Although McAllister’s work (2004) has outlined rhetorical exigencies in game development, and other scholarship has examined ad hoc and internal communication strategies between game developers, the relatively new exigencies of study created by remote work and its impact on technical communication have largely remained absent.

In addition to the above, new exigencies came into view during the emergence of the COVID-19 pandemic that began in early 2020 and forced creative industries such as the video game industry to migrate to remote spaces for communication and collaboration. The recent lack of ad-hoc technical communication and social engagement practices have necessitated a restructing of collaboration strategies and techniques for developers. As the pandemic continues to create new exigencies for remote labor and redefine social and technical communication, it is important to investigate this shift to remote work enabled by digital technologies and its impact on developers. Talks at the annual (and recently online-only) Game Developers Conference have demonstrated the industry’s interest in this shift and impact (Balisacan, 2021; Bernstein et al., 2021; Spaulding, 2021). At this juncture, then, this study aims to fill the gaps in scholarship at the intersection of technical communication and game development, focusing on how communication and collaboration strategies manifest during remote work, what software applications and media are employed by developers to create and build games and communicate with other developers during the pandemic, and what the challenges and impact of remote work and game development look like during the pandemic.

**METHODS: SURVEYING THE IMPACT OF COVID-19 & REMOTE WORK**

This section details our methods of recruiting and surveying members of the IGDA for the Research Ethics Board (REB) approved study.

**Data Collection & Survey Design**

Participants for this study were recruited through IGDA member lists: members received an email from IGDA with a link to the survey to be filled out via Google Forms. After consulting with our partners at the IGDA, we designed the survey to address mental health and perceived productivity, as well as ask whether developers saw a need to return to physical offices to improve either of the latter two areas. The survey itself recorded demographic information such as participants’ age, gender, and occupation/title at their current company. Following the demographic information, participants were asked to rate their mental health on a 7-point scale, with 1 being “Very Poor” and 7 being “Excellent,” as they understood it both prior to and during the height of the COVID-19 pandemic. This question mirrored the IGDA’s 2020 survey of its membership and its aims for hosting the 2020 Game Development Crisis Conference (“COVID-19 Resources”) and was included to see if there had been any significant changes since the initial transition into remote work. As the IGDA found when it surveyed developers, “many are finding their new environments distracting, particularly those with dependent children” (“Remote Work, Distractions, and Unemployment — IGDA’s COVID-19 Survey Results”). Finally, the survey asked three open-ended questions for participant response, the brief list trying to be mindful of time constraints wrought by the pandemic.
1. In one word, how would you sum up your overall work experience during the pandemic?

2. A number of game developers have reported difficulties communicating/collaborating with their team(s) remotely (e.g., GDC’s “State of The Game Industry 2020: Work from Home Edition”). How would you respond to this?

3. Game studios have reported plans to return to the office, take on office-home hybrid models, etc. (e.g., Ubisoft’s report). Do you think a return to the office will increase productivity, and if so, why?

After the initial survey questions, participants had the option to provide an email address if they consented to be contacted later for follow-up interviews. Once we had reviewed the survey data, we generated purposive samples of individuals who consented to follow-up interviews and sent out batch requests. These semi-structured interviews took place over Zoom roughly two months after the survey was completed; participants were reminded how they had responded to particular questions and asked to elaborate, with follow-up questions aiming to gain more insight to the contexts and experiences their initial survey responses could only allude to. Although this article focuses on the survey phase of our study, our “Implications” section also provides brief excerpts from our interviews we intend to expand upon in future works.

Data Analysis

With regard to analyzing our survey data, we took a mixed methods approach, as we wanted to see both patterns from the quantitative and qualitative data and how they worked together to craft a fuller picture of varied remote work contexts in which participants were working. In addition to the relevant statistical tests, we also performed word frequency analysis and sentiment analysis on the responses to the first question of the survey, quantifying some of our qualitative results in order to see patterns standard qualitative methods might otherwise miss, though we performed the sentiment analysis by hand rather than using software. We began this process using a grounded theory approach by categorizing responses to our first qualitative survey question above as either positive, negative, or neutral, but soon added a mixed and undetermined category, as some responses such as “half down/half up” appeared both positive and negative, rather than neutral, and others such as “busy” or “intense” were clearly not neutral, but also clearly not positive or negative. Three researchers coded the responses individually and then the team compared results to test for reliability; our codes were the same in 92% of cases, and we then had a collaborative discussion to finalize the remaining 8%. In most cases, our coding differences were between the neutral and undetermined category, as there was often overlap or a case could be made for either interpretation more readily than for the other category combinations. The following table provides an example section of this process.

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<td>Up &amp; Down</td>
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</table>

Table 1. Sample Sentiment Coding

In our coding of the qualitative analysis, we categorized responses to each survey question based on common themes we noted while reading responses. For the second question examining the pandemic’s impact on communication/collaboration, responses fell into one of four categories: those who mentioned difficulties with remote communication/collaboration, such as not being able to have quick chats with teammates, those who did not find it difficult or even found it easier to communicate/collaborate remotely, usually due to the ease of access to messaging apps such as Slack, and responses that were either a mix of the two previous categories, or undecided. For the last survey question, we coded results to the final survey question based on if participants agreed with a return to the office as a means of increasing productivity, if they disagreed or thought that a return to the office would decrease productivity, if they opted for a mixed or hybrid approach to remote/office work, or if we could not tell their opinion based on the response. Finally, after quantifying the categories established for these two survey items, we performed a Pearson r and t-test to see if these specific responses indicated any relationships.

RESULTS: HAVE GAME DEVELOPERS FELT MORE PRODUCTIVE IN REMOTE PANDEMIC ENVIRONMENTS?

As previously noted, our study began with emailing a survey to all IGDA members and proceeded with follow-up interviews with those participants that indicated interest. As this is the first of several articles planned for this study, this section focuses on the results of our mixed-methods survey.

Participants

A total of 246 members of the IGDA responded to the survey, but one response did not review the informed consent and their data was removed, leaving a final response rate of 245. Participants’ ages ranged from 21 to 71, with the majority between 30-45 years old; 69% (169) respondents were male, 24% (59) female, 4% (10) nonbinary, and the remaining 3% (7) chose not to disclose gender. The age and gender spread matched the general profile of IGDA members as noted in the organization and Western University’s 2020 Game Developer Satisfaction Survey (Weststar, 2021, p. 5-6), and thus is most likely an accurate representation of larger IGDA membership as far as demographics. Finally, though respondents provided a number of unique role titles, these roles can be condensed into four categories, with 38% (93) supervisory or administrative roles such as project managers/directors, 37% (90) programming or development roles such as software developers, 17% (42) creative roles such as freelance artists, and the remaining 7% (17) academic roles such as professors or graduate students (the remaining 3 participants did not provide a title/role). That said, despite these four discrete categories emerging organically, roughly a third of responses held titles such as “Lead Art Director” or “Senior Project Manager/Developer,” reflecting the fact that the boundaries between roles within game development are often porous, especially in the case of creative directors.

Mental Health & Remote Work Experience

One key element requested by the IGDA for this survey was a general take on member’s overall mental health while working during the pandemic. Illustrated by Figure 1 below, participants rated their mental health slightly lower during the height of
Figure 1: Mental Health Ratings Prior to and During the Pandemic

Figure 2: Average Mental Health Ratings by Gender
the pandemic (M = 4.24, SD = 1.58) than prior to the pandemic (M = 5.42, SD = 1.2), indicating the pandemic as a likely cause of this dip, t(245) = -11.57, p < .00001.

We also examined these results for differences based on gender across our 4 categories; each group’s average prior and during means are provided in the graph below. Nonbinary respondents had the lowest overall mental health average prior to the pandemic at 4, or neutral, but the other three groups resulted in similar prior averages. That said, women and nonbinary participants reported a greater decline in overall mental health than men or participants choosing not to provide their gender, suggesting that the pandemic may have taken an additional toll on these groups in particular, illustrated in Figure 2. Finally, we also compared these ratings based on the 4 larger job type categories. As shown in Figure 3, while there was a clear decline overall, there were no significant differences in the amount of decline based on occupation/role.

Moving to the open-ended survey questions, we used a mixed-methods approach to quantify some of our qualitative results in order to see patterns usual qualitative methods may miss (Sierra & Eyman 2021). The first of our three survey questions asked participants to sum up, using only one word, their experiences working remotely; the following word cloud illustrates the most commonly used words, with good (13 instances), stressful (10 instances), great (9 instances), productive (8 instances), and remote (8 instances) appearing with the highest frequencies.

**Sentiment Analysis**

As our word frequency analysis clearly illustrated polarized responses, we also performed a sentiment analysis on responses to this particular question. These results further reinforced the fact that game developers experienced remote work more often on either one of the extremes, with 30% (72) of responses being positive, 38% (91) negative, 16% (37) neutral, 6% (14) mixed, and 8% (20) undetermined. Combining this information from the trends noted when comparing mental health, the mild decline in mental health as the pandemic continued may contribute to some of the negative sentiment found with regard to remote work.

Originally we hypothesized that negative sentiment might be because of increased difficulties working remotely as a member of a team, but this does not appear to be the case. Responding to our second open-ended question about difficulties, 42% (99) of participants reported that remote communication/collaboration either was not difficult or was easier than it had been in a physical office space. One respondent reported, “With most teams spread across the globe, remote communication has been a major focus point in recent years. If anything, the pandemic has advanced technology enabling this and we don’t see any significant difference in communication with local or remote teams.” Another wrote, “There are difficulties, but for those of us who are highly anxious and overstimulated in office environments there are also plenty of perks. More time to focus. Less distraction. Only going to mandatory meetings.” To emphasize this finding just a bit further, we draw on one more response that addresses a workplace structure established before the pandemic: “Communication within my team never missed a beat. Everyone at the company was already working remote one day a week (or more for a few rare remote hires) before the pandemic.”

Despite the majority of respondents citing no issues, 28% (67) did report difficulties, especially with regard to managing teams, and 15% (37) noted a mixture, most often citing organization or managerial concerns as being the hardest to tackle remotely. As one respondent stated, “It’s really difficult with [internet] connection lag, people without fail talk over each other, and it breaks a flow. It feels transactional. Some people don’t like cam so turn theirs off and straight up don’t contribute, it becomes a lot of noise.” Speaking to two positions, another wrote: “In 2020 I worked for remote-only company and it was not causing much difficulties, at
the end of 2020 I’ve started a new job in a company that was not remote-ready, so now it’s a bit complicated, especially with long meetings without any agendas.” The remaining 15% (35) responses were undecided as to if remote collaboration was more or less difficult. Despite the tendency to cite administrative concerns as a pain point, these percentages did not vary significantly when broken in role/occupation categories; that is, even when looking only at supervisory/administrative participants, the spread between categories did not suggest certain types of roles had more or less issues with communication and collaboration.

Our last survey question asked participants to weigh in on whether or not they thought returning to the office would increase productivity. Despite the slight decline in overall mental health and the 28% of negative responses reporting difficulties while working during the pandemic, 40% (96) responses did not think that returning to the office would increase productivity, and roughly 70% (67) of these responses even indicated that forcing a return to the office would decrease productivity. One respondent, for example, stated, “My own productivity will plummet as people can once again disturb me during tasks that require full focus.” Similarly, other responses noted things like less commute time and more control over their work hours/schedules as key reasons why they are more productive working from home than in the office. “The time going through traffic to the office and coming back to our home is lost time,” one respondent wrote. “At home, we can [complete] the work in our rhythm without the pressure of a guy or girl measuring our ‘productivity.’”

Though they had been presented with information about the larger games industry moving to remote work, developers themselves seemed to be aware of some of the individual contexts of their remote work experiences, as 34% (81) noted that a hybrid or mixed approach, or, one that combined remote work with either some individuals going to the office or individuals only going to the office some of the time was how they thought productivity would best be maintained or increased. Only 23% (55) of responses agreed that returning to the office would increase productivity, but these responses tended to point to distractions at home, usually children or partners, as being the contributing factor to their lower productivity rate away from the office. As with the communication/collaboration difficulties, role or title did not seem to influence whether or not participants thought returning to the office would influence productivity. However, age does seem to be a contributing factor, as 62% (14) of the responses indicating a return to the office increasing productivity were over the age of 45. As one respondent in this age demographic reported, “[Returning to the office makes it] easier to make decisions and get answers in person. [It’s] [a]lso better for collaboration and inspiration.”

Statistical Analysis

After breaking down the above responses, we performed a Pearson r correlation test to see if there were any statistically significant relationships between individuals who found it more difficult to communicate/collaborate remotely and those who thought returning to the office would boost productivity. Though there was technically a positive correlation between those that had difficulties communicating/collaborating and those positing that a return to the office would boost productivity, the overall relationship between these two variables is weak, $r(244) = .457$, $p > .05$. As no statistically significant relationship was found, these data suggest that despite some of the issues with remote communication/collaboration, the majority of game developers do not see being in a physical shared office space as essential to their productivity.

Deepening the context of the survey responses, the next section discusses the implications of such findings and contextualizes our plans for future research based on both the above survey results and additional case study interviews from a handful of survey respondents who agreed to be contacted after completing the initial survey.
IMPLICATIONS & PLANS FOR FUTURE RESEARCH

The results of our survey to IGDA members offered a temperature check of game developers working amid pandemic-strained conditions, whether remotely, in-person, or in hybrid contexts. As the results revealed, mental health overall declined during the pandemic and sentiments about the pandemic and remote collaboration and communication were overall mixed, regardless of age, gender, or occupation. However, negative and mixed feelings about returning to in-office work ran high, raising questions about how well developers have transitioned to remote work. In response to such results, this section focuses on three implications and limitations for studying game development and technical communication in a (post-)pandemic-strained world. Throughout this discussion are excerpts from interviews that have figured into our future research plans.

Women and marginalized game developers coping and working amid pandemic conditions

Designed with our goal of honoring the time of game developers taxed in various ways by the pandemic, our survey was brief, including only five questions that developers could complete in 10 minutes or less. What was clear was that women and nonbinary developers saw more decline in mental health than men. This finding is no surprise to us, as women developers, for example, have long been facing an uphill battle for equality in the game industry (Hepler, 2019), not to mention facing a world where work and home lives have been inseparable (Cahn, 2021; Power, 2020). Recent scholarship and news articles about working women and COVID-19 continue to warn about disproportionate effects on those who aren’t white, male, and middle-class (Feng & Savani, 2020; Flaherty, 2020; Readon, 2021; White, 2021). As Judge (2021) argued in article about game development for The Guardian, “Black women from working-class families are already underrepresented in games studios, so for those graduating from state schools in 2020...there’s a significant mountain to climb before entering the games workforce, and it would be understandable if they’re already exhausted.” Women and BIPOC in writing studies writ large are exhausted, too. To echo Manivannan and Osorio’s (2021) call for stories of care work: “We don’t know about y’all, but we are tired…..parents, disabled people, and caregivers have been disproportionately severed from their usual networks of care at the same time we are overwhelmed by care work for ourselves or others.”

Our survey provided an in-road to understanding exhaustion and other mental health consequences in (post-COVID) game development and technical communication more deeply. If hybrid and remote workplaces become even more commonplace in the game development industry, future research questions might focus specifically on how women and marginalized developers are coping with the industry’s new normal. For example, we wonder if hybrid and remote workplaces will amplify the “refusal” strategies of games creators, like those in Harvey’s (2021) of students: “This student is direct about the costs of trying to belong – physical and emotional distress, isolation, discomfort in an exploitative internship, and a sense that she would have to change her style to fit into the industry, a sacrifice she ultimately refused to make” (p. 12).

The learning curves of remote communication and collaboration

The mixed bag of responses to our question regarding the difficulties of remote communication and collaboration opened our eyes to the varying ways in which game creators adapted to—and perhaps were already well-suited to work amid—the pandemic. Beyond revealing that the industry is divided about remote communication and collaboration, the answers to our open-ended questions show numerous mini-narratives about the workplace adaptations and the learning curves of adopting remote practices. Within those mini-narratives, we see several references to channels and platforms of technical and professional communication. One respondent, for example, wrote in: “Our company started using Zoom and Slack as a means to communicate with each other, and while we lost some of the niceties of being in person, like being able to whiteboard problems in a more organic way, overall our communication and collaboration have been well.” Another stated, “For me, communication in person is only slightly easier/quicker than a video call. Chat communication is fantastic for record keeping, but very time consuming!” Their responses echo those by game developer responses in the public sphere. As one anonymous developer told Kim (2021) of the gaming news site IGN, there is “a bit of latency when artists are using a stylus and pad at home while remoting into their work computer to when it shows up on screen, people just being tired and burnt out of work being home and home being work.”

These mini-narratives in our study and beyond warrant a deeper investigation into specific tools and resources used by already remote or now-remote teams. At the time of writing this article, we were conducting follow-up interviews with survey respondents and subsequently composing case studies for future research. Preliminary results have revealed more substantial narratives about adapting to remote work. Consider Arem’s commentary about his production company’s story about delivering audio-recording tools to voice actors behind video games.

We basically created these systems with a computer system, a preamp, a microphone, everything self-contained, all pre-wired; the actors just literally open up the case….Once we built these rigs, [employees were] going to be scheduling, delivering sanitizing, sterilizing, and scheduling all the delivery of these rigs. And now, we send out six to eight rigs a day. We bought a Prius that [sic] Molly, our head of operations, she’s delivering literally about 3,000 miles a month right now. (n.d., personal communication)

Regarding the next steps of our study, narratives like Arem’s will parlay into case studies for future game developers and those who are responsible for technical communication channels in the industry.

Relationships between social interactions and productivity

Those times where you’re sitting in front of the computer, and your teammates are there, and a programmer would just pull in their teammates, saying, ‘Hey, can you come look at my screen and check this out?’ You can’t do that in a work-from-home situation. (Kim, 2021)
The above quote from game director Naoki Yoshida, of the role-playing game Final Fantasy XIV, speaks to a third and final strand of future research that emerged from our survey. A number of open-ended responses in our survey contained comments about what might seem like insignificant social interactions with colleagues, such as the one above. Though some who completed our survey desire “easier collaboration, more comradery, and much stronger relationships,” the responses are overall mixed. As one respondent wrote of in-office productivity, “It will increase team cohesion and get everyone back on the same page, but it will decrease productivity as more time is spent being social.” In contrast, another said, “I actually worked remotely for over a year before the pandemic, and I can say from my experience that you miss a lot of the nuances and joy of the workplace.” Such mixed responses raise more questions about the future of hybrid work models as well as the value developers place on social interactions and materialities only available in shared workplaces. That is, we’re left wondering, how crucial are social and socially imbued materialities for communication and overall productivity behind a game? Such a question is lingering as we complete case studies for this project.

Writing studies scholars have demonstrated that composing (in the broadest sense) is a social activity, that the writer never writes alone but amid a confluence of (remote) bodies and ephemera (Read & Swarts, 2015; Reider, 2016; Rule, 2019). This body of scholarship will shed light on interview excerpts from our case studies, like this one from Jennifer Scheurle:

> Especially as a leader, especially as a designer, a lot of the collaborative aspect comes from being in a room with people, sitting with a whiteboard and revving on things together. And I find that so much easier when I’m in a room with people, I find it almost impossible to do virtually. (n.d., personal communication)

Here, Scheurle reminds us that social interactions may be more or less crucial depending on the roles of the game developer. Her commentary also reminds us of the ways in which creative teams are trying to emulate workplace environments in virtual reality. Mozilla Hubs (n.d., “Welcome to Hubs”) and AltspaceVR (n.d., “AltspaceVR Beginner’s Guide”) are two of several platforms that host 3D, virtual meeting rooms with avatars, text input options, and voice chat for groups. As Mozilla advertises, you can “Communicate and Collaborate: Choose an avatar to represent you, put on your headphones, and jump right in. Hubs makes it easy to stay connected with voice and text chat to other people in your private room.”

**CONCLUSION**

Video game development is a significant industry and form of creative and technical expression, cultivating dozens of independent and major studios across the world. In cities such as Toronto, Montreal, San Francisco, Paris, and Tokyo, COVID-19 has undermined the stability of developers, the shift to remote work having created a number of productivity challenges, including losses of collaborative culture, physical spaces (e.g., at a coffee shop, in proximity to peers) and time vital to production. As a field, we can’t afford to ignore communication challenges and related sentiments wrought by COVID-19, for technical communication, including the seminal game design documentation, has become more dispersed and asynchronous than ever. In the context of our study, recent books in the field have covered player embodiment (Anable, 2018; Holmes, 2017), student-teacher experiences (Eyman & Davis, 2016; Plass et al., 2020), and social justice (Chess, 2020; Stokes, 2020). Understandably, game studies and technical communication scholarship has yet to offer empirical data on the pandemic’s impact on game developers and their production practices. In these unprecedented times, our study is a timely project that responds to the pandemic, aiding industry professionals and modeling future studies of creative and technical practitioners working amid global challenges.

Our study demonstrated that most workplaces and their larger industries are exploring whether their employees returning to physical offices will be necessary for their particular company. Combining the results of our survey data above with IGDA and Western University’s recent Developer Satisfaction Survey indicates that for game developers, remote work in some form isn’t going away any time soon, and challenges need to be addressed. However, reinforced by our interviews, our findings revealed that even when remote work generated its own unique challenges, working from home did not impact employees’ sense of productivity. That said, it is clear from our results that whether or not working from home impacts productivity, it certainly does impact mental health, and leads to a loss of social connection. In addition, as noted by other researchers across various fields, remote work seems to put the greater strain on caretaking members of the household. Despite these factors, most participants from this study indicated that at most they would want only a hybrid, rather than a full, return to the office, or to have an office space available for those that did want to be in a shared physical work space. As such, if we ignore how game development and technical communication have been complicated by, and responsive to, hybrid workplaces, then we risk downplaying COVID-19’s lasting impact on the industry.

During the initial design stages, we assumed the goal of our research would be to uncover what strategies and software developers preferred to maintain productivity when working from home. However, the data seem to indicate that more focus may be needed for how companies can create and maintain a sense of personal connection and sociality without being physically present with one another. Further, as this research seems to indicate that a number of game developers will not be returning to the office when the pandemic subsides, technical communication has become an even more vital element of the game design process, indicating the need for more research into how to best construct and disseminate such communication in remote and hybrid contexts.

**REFERENCES**


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Ethical Design Approaches for Workplace Augmented Reality

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ABSTRACT
Augmented reality (AR) technologies are increasingly being implemented in various workplace contexts; however, they pose a number of ethical design challenges. To discern the ethical implications of workplace AR, this article conducts an analysis of the promotional discourses surrounding a workplace AR system. This analysis demonstrates a tendency to frame AR technologies in terms of a transhumanist evolution in worker agency and organizational efficiency. Such discourses elide applications of workplace AR for purposes of worker surveillance and exploitation. The article concludes by outlining speculative ethical design guidelines that communication designers can take up in their work on workplace AR systems.

CCS Concepts
human-centered computing

Keywords
Augmented reality, Wearables, Ethical design, Workplaces

INTRODUCTION
Reflection Technologies created one of the world’s first wearable computing headsets in 1989. Named the “Private Eye,” the system worked by positioning a small computer display directly in front of the user’s right retina, thereby relying on persistence of vision to trick the user’s visual processing system into perceiving the information that appeared on the screen as if it were superimposed onto their physical surroundings (“Reflection Technology,” n.d.). Although the technology was still quite new, researchers at Boeing took notice and began developing strategies for the implementation of wearable computers as an instructional tool within industrial manufacturing.

Today, wearable AR technologies are becoming commonplace in many workplace and industrial manufacturing contexts. Manufacturing experts have increasingly turned to the viability of wearable AR within industrial workplaces, often noting the viability of AR as an “in situ” instructional aid to enhance the efficient acquisition of worker knowledge (Funk et al., 2017; Sorko & Brunhofer, 2019) or as a tool for promoting compliance with workplace safety protocols (Kim et al., 2016). Workplace AR systems have been seen to facilitate the rapid production and dissemination of instructional materials. Through these emerging wearable systems, for instance, an expert worker can create situated instructional AR content and “pin” this contextual multimedia experience to a physical location or object, such as a short tutorial that instructs a new employee on the proper procedures for repairing a new piece of machinery. Studies have indicated that these kinds of contextualized AR instructional materials can speed the acquisition of workplace skills for new employees (Funk et al., 2017). As such, wearable AR technologies augur a new technical design paradigm for the creation and circulation of workplace knowledge and in situ communications.

Of course, emerging alongside this trend toward wearable AR training systems is the continued growth in exploitative labor practices that seek to further track, control, and monetize worker activities at ever more granular levels. Amazon fulfillment centers, for instance, are regularly cited as examples of this trend where
worker movements are increasingly monitored, and even gamified, in order to boost productivity, often at the expense of workers’ physical and psychological well-being (Samato, 2020; Statt, 2021). Indeed, recent research in industrial manufacturing processes has explored the implementation of gamification-based AR systems for boosting the picking time in fulfillment centers (Ponis et al., 2020).

These converging trends of wearable AR and worker optimization necessitates careful examination from the technical writers and designers who will be participating in the creation of such systems for various workplace contexts. In particular, technical designers have an important role to play in developing more ethical user-experiences for wearable AR that attend not only to the efficient circulation of workplace knowledge but also to the well-being of workers.

To that end, this article works to develop an ethical communication design framework for workplace AR systems. The article begins by outlining current approaches to AR ethics. Although current theories offer a capacious framework for considering the ethical implications of this emerging technological paradigm, we are in need of more focused design heuristics that attend more explicitly to the unique ethical problems and power imbalances of the workplace. To clarify the exigence for this ethical design framework, I conduct a close analysis of the marketing and promotional materials surrounding the Vuforia Expert Capture workplace AR system. This analysis demonstrates a tendency to frame workplace AR technologies in terms of a transhumanist evolution in worker agency and organizational efficiency. Such discourses serve to further elide the ethical implications of workplace AR as a tool for worker data collection and bodily surveillance. Building from this analysis, I outline a speculative ethical design framework for workplace AR systems oriented through four interconnected design layers: Interface, Document, Monitoring, and Context. Together, these layers help to orient designer attention to the complex technical, biological, and procedural implications of workplace AR as not only a tool for enhancing and improving workplace activities but as a potential site of worker exploitation.

ETHICAL DESIGN HEURISTICS FOR AUGMENTED REALITY

Scholars have had a long standing interest in the ethical dimensions of technical communication work (Dombrowski, 2000; Katz, 1992). More recently, scholars have become invested in interrogating the ethics of technical communication in various social and technological contexts, including health and medicine (Melonçon et al., 2021), interface design (Gallagher, 2019), pedagogy (Duncan, 2022), and online hacktivism (Colton et al., 2017). This trend dovetails with increasing investment in social justice frameworks within technical communication practices and scholarship (Agboka, 2013; Jones, 2016; Jones et al., 2016). These efforts seek to orient the field more explicitly to issues of power and ideology in order to tease out the complex design and communication processes through which texts, users, and technologies craft new ethical relations amongst one another: “...technical communicators must be aware of the ways that the texts and technologies that they create and critique reinforce certain ideologies and question how communication shaped by certain ideologies affect individuals” (Jones, 2016, p. 345).

Such research is indicative of the growing ethical considerations that technical communicators and designers must take into account when investigating increasingly complex socio-technical relations. As Mara and Hawk (2009) explained, the increasing imbrication of human users and computational systems requires “broader and more rigorous investigation of technical writing’s connections to the automated and globalized workplace and the multiple systems that users and producers inhabit” (p. 6). Importantly, Mara and Hawk’s posthumanist approach does not seek to devalue the agency and rights of human workers but rather strives to make transparent the complex interrelationships through which humans, machines, and texts interact and instantiate new systems of power and informational exchange.

Within the context of wearable and augmented technologies, design researchers have addressed the ethical implications of this emerging computational paradigm within education (Christopoulos et al., 2021; Steele et al., 2020), health and medicine (Jones et al., 2017; Tu & Gao, 2021), and from socio-cultural perspectives (Sandor et al., 2015). Much of this research is concerned with the potentially invasive and exploitative capacities of wearable and/or mobile AR technologies, not only in terms of tracking and controlling user data but in producing potentially harmful physical and/or psychological effects through the realistic convergence of digital and material spaces. As such, design researchers are increasingly focused on developing design guidelines and heuristics to inform the development of more ethical, human-centered AR experiences.

Ethical design heuristics for AR systems can be considered through the two broad categories of spatial and bodily augmentation. In this first category (spatial), designers are interested in explicating frameworks that can contribute to the design of AR experiences that are respectful of cultural and/or political meanings of public and private spaces. Carter and Egliston (2020) provided a succinct overview of this particular area of research, noting that AR technologies with mass appeal (e.g., social media AR) could possibly facilitate new forms of geo-located AR hate speech at culturally sensitive sites (pp. 8–9). The popular mobile AR game Pokémon Go is often cited as an emblematic exigence for developing ethical guidelines for place-based AR experiences, whether due to players intruding onto private property or catching digital monsters at culturally sensitive sites (Carter & Egliston, 2020, p. 10; Radziwill, 2019, p. 34). Moreover, as Carter and Egliston (p. 14) pointed out, spaces and bodies are deeply interconnected in AR, particularly within experiences that make ableist assumptions about the user’s mobility in relation to their physical surroundings (e.g., an AR experience that requires a wheelchair user to traverse a set of stairs).

Another area of research in AR ethics is focused more on the ethical implications of bodily augmentation, whether augmentation of the user or those within the user’s vicinity. This strand of AR ethics overlaps with research on wearables and emphasizes a design approach that highlights the importance of user autonomy and access to personal and/or bodily data. In an earlier work, Friedman and Kahn (2000) applied a Value Sensitive Design (VSD) approach to AR technologies. As a design philosophy, VSD works to interrogate how “a given technology is more suitable for certain activities and more readily supports certain values while rendering other activities and values more difficult to realize” (p. 163).

From this, they developed value-based guidelines for the design and implementation of AR experiences that attend to issues of psychological well-being, physical well-being, privacy, deception, informed consent, ownership and property and trust. Although AR technologies enable more ubiquitous and seamless interactions...
with one’s physical and/or social environment, these values work to curtail potentially invasive or exploitative instructions into the user’s (and others) sense of autonomy.

Friedman’s work with VSD has since developed into a full-fledged design framework and has been taken up within other AR design heuristics (Christopoulos et al., 2021; Radziwill, 2019; Steel et al., 2020). Radziwill built from the insights of VSD to develop a design heuristic for mixed-reality experiences known as the “conscious reality” (CoRe) framework. The CoRe framework was developed through interviews with industry experts and professionals in AR/VR development (p. 41). From this data, Radziwill (2019) offered an eight-part CoRe design questionnaire, which works to surface the ethical implications of a particular mixed reality experience by drawing designer attention to issues of mental and physical well-being, user privacy, and proper disclosure and consent practices within mixed-reality design (p. 44–45). In a similar vein, Mann et al. (2016) developed a “Code of Ethics on Human Augmentation, which focuses primarily on how personal or bodily data are/will be collected, accessed, and manipulated in AR systems. As such, their code of ethics is oriented through three fundamental laws: 1) Metaveillance: humans have a right to know when they are being surveilled, 2) Equality: humans have a right to monitor entities that are monitoring them and to use this data as they see fit, 3) Aletheia: humans have a right to immediate access to their own data and augmented technologies must be developed in a critical, transparent manner. Similar to the insights of VSD, Mann et al. (2016) emphasized the importance of data privacy and user autonomy within technological systems that purport to collapse distinctions between humans, technology, and digital/physical spaces.

Considering the ethics of wearable technologies, Tham (2016) advocated for a “sociotechnological” design agenda, which he claims can help us to better identify the contextual processes through which new technologies engage with existing social and cultural relationships:

A sociotechnological perspective sees technology as constructive tools and emphasizes context, power, ownership, connection, and relevance as key issues surrounding uses and implications of technology...

For wearables specifically, a sociotechnological agenda helps tech entrepreneurs to focus on the sociocultural contexts in which devices are worn and used, urging them to see technology as socially situated objects rather than universal commodity.

(p. 7)

Technical writers and designers play an important role in crafting the sociotechnological agenda of wearable technologies within various contexts (e.g., workplace settings). Indeed, Tham (2018) has noted elsewhere that there is an ethical obligation on the part of technical communicators to advocate for user rights in wearable and IoT systems: "...technical communicators also serve as user advocates who keep watch on ethical issues in immersive media design" (p. 60).

Duin et al. (2019) developed a seven-part design heuristic for AR experiences, focusing on areas of authenticity, embodiment, empathy, accessibility, usability, experience, and immersion. Similar to the other design heuristics mentioned here, these areas shift designer focus away from “device-centric” affordances of AR technology and toward the contingent, “human-centric” experiences that emerge when AR is utilized in particular situations and contexts (p. 110). Their heuristic worked to uncover not only what might make an AR experience more enjoyable or entertaining (immersion, authenticity, experience) but also how AR experiences can be designed to accommodate diverse users and experiential contexts (usability, accessibility, embodiment, empathy).

A recurring theme in ethical design frameworks for AR is an attempt to mitigate unwanted and/or invasive user monitoring practices. Flanagan et al. (2015) in particular encouraged designers to consider the profound shift in bodily monitoring capacities made possible through workplace wearables (p. 42). Noting the implementation of worker-tracking technologies in various workplace contexts, they write that through workplace wearables, “monitoring is not an autonomous choice made with agency... but an act placed onto individuals within the power dimensions of the workplace itself” (p. 42). Similarly, Carter and Egliston (2020) warned of the continued convergence of invasive employee monitoring practices and the granular body tracking affordances of wearable AR systems (p. 23). Ultimately, however, they note that they have “identified no existing literature...that critically addresses the implications of AR in the workplace” (p. 27). As such, further investigation is necessary to extrapolate the complex ethical dimensions surrounding the design and implementation of workplace AR systems.

To this end, I turn to an analysis of a specific workplace AR technology: Vuforia’s Expert Capture system. Expert Capture (EC) is a flexible AR software tool that runs on the Microsoft HoloLens optical display, offering a suite of haptic graphic templates that allow seasoned workers to document contextual instructions for completing a workplace task, such as the steps for repairing a complex piece of machinery. The EC system is a proprietary software platform intended for use in large-scale manufacturing contexts. Ideally, design researchers would be able to observe and/or interact with the EC system and its attendant technical documentation in order to discern its specific functions and features, which would provide a more robust data set for elaborating a set of ethical design guidelines for workplace AR technologies. However, access to the technology itself was beyond the scope of this article. Vuforia was contacted in order to gain access to the technical documentation for the system for further analysis, but these requests were met without response. As such, my analysis focuses primarily on the marketing and promotional materials for the EC system on the Vuforia website as well as reference to the technical documentation of its underlying hardware, the Microsoft HoloLens 2.

This analysis aims to explicate how the marketing and promotional discourses surrounding a particular system might generate insight into the broader design trajectories of workplace AR being forwarded by the technology industry. In this, my approach is akin to Wong and Khovanskaya’s (2018) attention to promotional materials as “speculative artifacts” through which researchers can discern emerging design values within the technology industry (p. 189). Wong and Khovanskaya have pointed in particular to corporate concept videos as highly influential to the social and cultural meaning of an emerging technology. Corporate concept videos showcase predicted use-cases of new technologies that may be in various stages of development. These videos are not only marketing materials but speculative artifacts that reveal how organizations envision the particular “sociotechnical configurations” in which their products will be deployed (p. 187).

As such, Wong and Khovanskaya noted the potential of examining corporate concept videos in order to “surface aspects of the
companies’ narratives that may not be at their central focus, but could have significant implications for people if those narratives come to fruition” (p. 189).

My own analysis considers the diverse promotional materials surrounding EC, and not just concept videos. In particular, my analysis considers how the prevalence of transhumanist discourses within the EC promotional materials (concept videos, website content, consulting reports, etc.) further normalizes a sociotechnical configuration in which workplace AR is viewed primarily as an extension of workers’ physical and cognitive agency over a variety of workplace materials and activities (e.g., training, accessing information, peer-peer communication, etc.) rather than a more radical transformation of workplaces’ ability to monitor, track, and evaluate worker efficiency. As such, these discourses hold significant ethical implications for how wearable AR systems are imagined, and ultimately designed, for a variety of workplace contexts. In particular, such discourses reveal a growing tendency to frame workplace AR alongside broader movements within AR discourses that conceptualize the human body as a site of technological evolution. In this, AR becomes the primary means for optimizing and enhancing one’s physical engagement with the world; however, as I discuss here, such discourses threaten to further atomize worker bodies into discrete units of measurement that can then be more easily subjected to processes of tracking, evaluation, and control.

TRANSHUMANIST DISCOURSES IN VUFORIA EXPERT CAPTURE

Wearable technologies are often imbricated within discourses of transhumanist evolution, offering new capacities through which humans can gain greater control over the physical and biological systems in which they are enmeshed (Gouge & Jones, 2016; Pedersen, 2012). Transhumanism is a cultural movement that seeks “a limitless human future achieved by means of intentionally appropriated technologies… [designed] to deliver future generations from the frailties of the human condition” (Herrick, 2017, p. 5). Transhumanist discourses are often explicitly evolutionary, positing technological change as not merely a linear progression to more advanced modes of human life but a more fundamental revaluation of what it means to be and act as a human-machinic assemblage.

Although perhaps not as explicit as some other forms of transhumanist practice (e.g., biohacking), AR systems often implicitly align with the ideals of the movement by situating wearable technologies in general as inherently empowering for their human users. Workplace AR technologies, for instance, are often presented as extensions of specific computational processes that allow the user to carry out different tasks in a more knowledgeable and/or expedient manner. In this, the human user of AR remains fundamentally human and in agential control of not only the device itself but of their immediate surroundings.

Indeed, discourses surrounding wearable AR often normalize notions of computational advancement as inherently progressive and empowering for the user. Pedersen (2008) noted that digital design rhetorics surrounding AR often play up its potential to expand human agency and to improve our daily lives through a discourse of betterment qua computational extension. Elsewhere, Pedersen and Ellison (2017) found that popular media representations of optical AR technologies couch implicit transhumanist values within explicit appeals to AR’s application as a medical technology (e.g., glucose monitoring, heart-rate tracking) (p. 671). This distortion, they claimed, can further minimize critical dialogue surrounding “mainstream (non-medical) justifications for [AR] adoption,” which entail a number of pressing questions about the social and cultural implications of optical AR technologies, such as data privacy and surveillance (p. 677). Similarly, Pedersen and Trueman (2017) explicated the promotional materials and online discourses surrounding Google Glass, one of the world’s first mass-marketed AR devices. Pedersen and Trueman (2017) noted that, together, these cultural discourses frame Google Glass (and thus to a certain extent AR in general) within a rhetoric of seamlessness and ease. They warn that this media framing further perpetuates a “perfectionist, transhuman” perception of AR as a technology that erases socio-material barriers by extending user agency out into (and over) all facets of daily existence (p. 70). Pfister (2019) offered a close analysis of the neoliberal ideologies within Sergey Brin’s popular TED talk “Why Google Glass?”. Here, Pfister traced Brin’s underlying assumption that AR is the next phase in not only computational but human evolution, an insight that aligns with Pedersen’s insights concerning AR’s ongoing imbrication within a transhumanist discourse of “betterment” (Pedersen, 2008, p. 168). Such discourses, as Pedersen (2008) has reminded us, are not natural, and the notion that wearable AR necessarily leads to a “better” outcome is an assumption that we should continue to question as such technologies are taken up by various industries.

We see similar discourses of empowerment and control over bodily systems emerging within the promotional discourses surrounding the Vuforia “Expert Capture” system. Throughout their promotional materials, Vuforia emphasizes the ability of wearable AR to revolutionize existing workplace practices like employee training, technical documentation, and peer-peer communication. In a promotional video for the EC system, the narrator states:

Industrial manufacturers are expected to face millions of unfilled jobs in the next decade. Their ability to leverage existing resources and improve productivity has never been more important. Now is the time to evolve how workers access and learn critical information [emphasis added]. (Vuforia, a PTC Technology, 2019).

In this, Vuforia articulates the interface affordances of the wearable AR alongside contexts that emphasize worker agency, flexibility, and control over workplace knowledge bases. Through this, Vuforia strives to emphasize wearable AR as a site of worker empowerment as well as an inevitable evolution in how workers create, share, and access information. As such, the transformational capacities of wearable AR become articulated as a means for evolving and advancing user agency in relation to workplace knowledge.

In looking closer at the promotional materials surrounding EC, however, we see various rhetorical moves that indicate the capacity of wearable AR to monitor and surveil worker activities. For instance, the landing page for Expert Capture notes that the device enables “digital traceability” to increase worker compliance with industry safety standards and other regulatory protocols (“Vuforia Expert Capture: AR Knowledge,” n.d.). Although Expert Capture is not explicitly designed for monitoring worker activities, discourses of “traceability” nonetheless situate wearable AR as an extension of existing workplace surveillance practices. The product landing page for Expert Capture similarly emphasizes the system’s ability
to speed production times and facilitate the rapid acquisition of worker knowledge and skills: “Vuforia Expert Capture enables you to digitize and optimize your critical workflows [emphasis added]. With AR-enhanced procedures, your frontline workers can become more efficient and effective [emphasis added] at even the most complex tasks” (“Vuforia Expert Capture: AR Knowledge,” n.d., emphasis added). Of course, vague pronouncements of technological advancement and increased worker efficiency are par for the course in the promotional materials for emerging workplace technologies. This is nothing new. However, looking closer at this phrasing, it is apparent that these statements further abstract and obscure the exact bodily and/or procedural aspects that will be “digitized and optimized” through the system, preferring instead more generic terminology like “critical workflows” and passive constructions that elide the precise technological parameters through which a worker “can become more efficient and effective” through a wearable AR system.

Monitoring is not in itself an unethical practice in workplace AR design. Indeed, the monitoring capacities of wearable AR systems may likely empower many workers to complete job related tasks more safely or efficiently, goals that are mutually desirable for both workers and employers. Although I could not find any evidence that the EC system utilizes biological tracking functions to monitor worker activities (e.g. heart rate, eye movements, etc.), the system hardware (Microsoft Hololens 2) offers eye tracking functionality that “enables applications to track where the user is looking in real time” (“Eye tracking,” n.d.). The documentation for the Microsoft Hololens further elaborates on the potential of eye tracking in optimizing workplace performance: “Eye tracking can provide natural, real-time, and objective information to help improve training, productivity and safety in the workplace” (“Eye tracking,” n.d.). In their discussion of technical communication as an act of articulating and rearticulating meaning, Slack et al. (1993) described how technical communication documents and practices can work to restructure the flow of power within a system:

Power is no longer understood as simply the power of a sender over a receiver or as the negotiated symmetry of the sender’s or receiver’s meanings but as that which draws and redraws the lines of articulation...Power is thus what works to fix meanings, that which empowers some possibilities and disempowers others (p. 28).

Clearly, the technical capacity afforded through wearable AR to automatically track workers’ eyes constitutes an emerging site of power within workplace contexts. However, the discourses of Expert Capture and the Microsoft Hololens seem to emphasize instead the capacity of wearable AR to empower workers’ access to informational materials. In this, the increased monitoring power over workers’ bodies that workplace AR systems would likely afford becomes articulated instead as a site of user empowerment and worker self-efficacy (“training, productivity, and safety”). Indeed, vague and euphemistic phrasing like “optimizing workflows” and “traceability” rearticulate (by downplaying) the radical power imbalance between workers and workplaces that persists within the integrated eye-tracking capabilities of the system hardware.

One of the more revealing documents in Expert Capture’s promotional materials is a consulting report on how Expert Capture aligns with best practices in educational psychology. This report operates alongside the other documents to rhetorically shape the scientific ethos through which wearable AR is implemented in workplace settings as an empowering technology designed to optimize workplace training. As such, the report aligns with broader cultural discourses of emerging technologies as a mode of bodily and cognitive evolution (Pilsch, 2017, p. 26). The report touts the ability of Expert Capture to facilitate more contextual, hands-on learning for workers. However, in doing so, the language in the report focuses less on workers’ agential role in creating, responding to, and interacting with workplace knowledge and more on the device’s capacity to act directly on workers’ neurological processes:

...you should consider augmenting your current training solutions with solutions that are optimized for the way that the brain [emphasis added] learns. The brain [emphasis added] learns most effectively when knowledge is presented in the flow of work and broadly engages multiple learning and memory systems in the brain [emphasis added]. (Maddox, 2019, p. 5)

As Jack (2010) noted, we should attend to how “arguments from neuroscience legitimate...political power” in ways that can be obscured through technical or scientific discourses (p. 408). Such discourses “can tend toward uncritical fetishization of the brain as a scientific object divorced from its historical and rhetorical context” (p. 409). In the report, workers are framed not as individual agents capable of shaping their own knowledge making practices but rather as a relatively homogenous biomaterial substrate (“the brain”) subject to the influence of a workplace device. In this case, the brain science report seeks to frame workplace AR as an emerging conduit through which an organization can shape and reshape workers’ biological capacities toward a desired end. In particular, the language in the report effectively fetishizes workers’ neurological processes as outdated workplace procedures in need of optimization. Although the Expert Capture system does not interface directly with workers’ brains, the language in the report nonetheless reveals a transhumanist impulse within wearable AR design by conceptualizing user bodies’ as increasingly discrete, optimizable units of activity.

As Pilsch (2017) noted, transhumanism is not simply a technological agenda but “a rhetorical mode, a means of creating and seducing through language about the future” (p. 11). By emphasizing Expert Capture’s ability to act directly on “the brain,” the report contributes to a rhetorical mode that further normalizes the workplace computer as a means for modifying and enhancing workers’ biological processes. Pilsch (2017) also noted that “transhumanist language offers a series of linguistic operations that project near-future evolutionary change and position technical artifacts as the vectors for producing this imminent overcoming” (p. 12). Workplace AR training systems may not seem as revolutionary as other transhumanist technologies, such as biohacking practices or age-defying pharmaceutical treatments. However, the rhetorical framing of these instructional devices in terms of worker evolution and workflow optimization further instantiates wearable AR as a technologically savvy solution for “overcoming” the limitations of workers’ bodies.
A SPECULATIVE APPROACH TO ETHICAL WORKPLACE AUGMENTED REALITY DESIGN

To be clear, an analysis of the transhumanist discourses within an AR device’s promotional materials is not equivalent to a more detailed analysis and observation of the technical documentation and functionality of the device itself. However, the prevalence of this discourse within the EC system, and throughout the AR development industry, nonetheless exerts a strong influence on how designers, organizations, workers, and managers understand and perceive the role of wearable AR within the modern workplace. As such, it is vital that technical communicators begin to develop approaches to workplace AR design that seeks to mitigate the exploitative potential of this emerging site of workplace computation.

Indeed, workplace AR systems do not exist in a technological vacuum but rather emerge and transform alongside other technocultural developments in wearable and augmented media. Future developments in wearable tech will likely incorporate more advanced bio-technical capacities, from heart-rate monitoring systems to galvanic skin response features. Rosenberg (2021), a longtime expert in the field of AR development, has speculated on the invasive capacities of wearable computing, which could easily be deployed to track and analyze persistent trends across users’ biological data (e.g., eye movements, heart rate, etc.) in relation to various experiences and media objects. Such developments are cause for concern, as Rosenberg noted:

…these platforms will not just track what you click on, but where you go, what you do, what you look at, even how long your gaze lingers. They will also monitor your facial expressions, vocal inflections, and vital signs (as captured by your smart-watch), all while intelligent algorithms predict changes in your emotional state.

Much like the user tracking common to social media sites, Rosenberg wrote that companies would be able to “characterize our [biological] behaviors over time” to influence user actions in not only digital but physical spaces as well (e.g., serving up geotagged advertisements in response to pupil dilation data). Such predictions are perhaps doubly concerning for workplace AR systems, where users’ biological data may be further subjected to the mandates of organizational expediency.

As such, communication designers might employ speculative approaches in order to better anticipate the divergent possibilities for an emerging technology like AR within various workplace contexts. Technical designers and digital rhetoricians engage in speculative practices by analyzing the particular constraints, possibilities, and affordances of a given technology or system and then developing insights based on these analyses and observations (Jones et al., 2017; Rivers & Söderlund, 2016; Sundvall, 2019). Rivers and Söderlund (2016) have advocated for a move toward “speculative usability,” a design approach that “focuses as much on discovering the multiple relations that an object has as it does on elaborating the specific dysfunctions that a user experiences in his or her encounters with an object” (p. 127). Although Rivers and Söderlund (2016) approached speculative usability more in terms of the generative or invention capacities of a particular technology, I am interested in speculation as a mode of ethical design, way of “discovering the multiple relations” of workplace AR systems and developing design approaches that orient these relations to more ethical ends.

Although regulatory oversight of workplace AR is much needed, and may very well emerge naturally as AR becomes more widely adopted across various industries, we should also consider how communication designers can take a more active, speculative approach in designing more ethical workplace AR systems. In particular, speculative approaches to workplace AR might take up what Colton and Holmes (2018) described as an “active equality” approach to technical communication ethics. Colton and Holmes (2018) described how contemporary calls for social justice in technical communication scholarship often implicitly rely on “passive equality” frameworks, which privilege certain entities (e.g., governments, regulatory bodies, corporations, etc.) as the exclusive distributors and enactors of justice. A passive equality approach to wearable AR, for instance, might petition a government agency or workplace to regulate workplace AR systems. Although appealing to such entities is certainly a vital and important element in advocating for more ethical designs for emerging technological systems, Colton and Holmes (2018) considered how technical communicators can also pursue more active approaches to justice in ways that do not require passively waiting for the actions of an external regulatory body: “...an active theory of social justice recognizes that equality is something that any individual, including professional technical communicators, can enact independent of a permissive institutional or governmental structure” (p. 12).

To this end, my next section elaborates a set of ethical design practices that can better enable designers to create more equitable applications of workplace AR. These guidelines are not intended as a redesign of the Vuuforia EC system; rather, they simply work to intervene into the transhumanist “narrative” that remains prevalent across various sectors of AR design and development (Wong & Khovanskaya, 2018, p. 189). As such, my approach is akin to what Sánchez (2017) described as “critiquing (after and above),” or the practice of “[developing] principles of design... [that] do not necessarily lead to any direct changes in the redesign of any specific artifact but may help to push the conversation forward in terms of what good design should do or look like” (p. 378). Specifically, I consider in my next section how a more worker-centered approach to workplace AR design might be productively taken up through consideration of four interconnected layers of AR design: Interface, Monitoring, Documentation, and Context. Each of these layers plays an important role in shaping how a workplace AR system affects worker agency and well-being in various workplace scenarios. In particular, attention to these design layers can help to counteract the impulse to conceptualize AR technologies exclusively as tools for extending worker skills/knowledge out into and over the workplace (i.e., a transhumanist perspective).

FOUR DESIGN LAYERS FOR WORKPLACE AUGMENTED REALITY

Communication designers play an important role in clarifying how particular workplace practices and values are realized (or not realized) through workplace AR systems. For instance, to design workplace AR systems according to transhumanist discourses of enhancement and evolution is to frame worker bodies as discrete sites of optimization (e.g., eyes for tracking, brains for enhancing, etc.). Although such discourses may seek to enhance user agency and cultivate more safe or efficient workplace practices, they can
also serve to conceal and/or normalize the emerging technological configurations taking place between worker activities, embodied practices, and various organizational protocols. Such “sociotechnical configurations” threaten to further entrench wearable AR as a natural development of existing workplace practices rather than a more significant transformation in how worker activities are captured, circulated, and monitored (Wong & Khovanskaya, 2018, p. 187).

As such, I elaborate here a set of design guidelines that aim to surface the ethical implications of workplace AR systems as they affect issues of worker privacy, autonomy, and well-being. Specifically, designers might consider more ethical approaches to workplace AR through four distinct, but intertwined, layers of AR design: Interface, Monitoring, Document, and Context.

In elaborating on these layers and how they might inform ethical design guidelines for workplace AR systems, I draw from principles of Value Sensitive Design (VSD) and Ethically Aligned Design (EAD). Friedman’s (2004) original articulation of Value Sensitive Design (VSD) described it as “an approach to the design of information and computer systems that accounts for human values in a principled and comprehensive manner throughout the design process” (p. 769). In addition to VSD, I also draw from the IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems, which elaborates principles of Ethical Aligned Design (Chatila & Havens, 2019). Similar to the guiding principles of VSD, EAD strives to guard against exploitative applications of emerging technologies by establishing design criteria that emphasize creator accountability and user agency within the system. In particular, the initiative’s emphasis on potential misuse shifts the burden to designers in ensuring that such technologies will not be applied in harmful or exploitative ways (Chatila & Havens, 2019, p. 31). The speculative design layers offered below offer a generative starting point for developing more ethically-aligned and value-sensitive frameworks for the design of workplace AR systems.

The interface layer orients designer attention to the elements of the system available for engagement by the worker. This could range from embedded instructional augmentations to the UX/UI display features of an optical display headset. Autonomy (Friedman & Hendry, 2019) is vitally important within the design of AR interfaces. Designing for worker autonomy might allow users to select and deselect features that they feel are most useful to them. For instance, the ability to easily communicate with other workers or peer into their field of view at any time might enable faster communication but could also affect one’s sense of autonomy and even engender a culture of constant micro-management if implemented as a default feature of a wearable AR system.

### Interface Layer - Design Recommendations
- Allow user control over data collection and monitoring features at device startup
- Display regular updates of current privacy display settings
- Implement design features that alert those in the user’s vicinity if monitoring features are being utilized
- Integrate UI features that maintain user privacy in relation to other users (e.g., worker-manager communications)

The monitoring layer considers the physical practices and biological systems available for tracking and/or augmentation by the system. This could include the biological systems/practices of the user (e.g., heart rate, GPS tracking, etc.), those within the user’s physical proximity, or other users of the system. Privacy and informed consent (Friedman & Hendry, 2019) are paramount to the monitoring layer of workplace AR design. Whereas privacy acknowledges an individual’s ability to determine the kind (and amount) of information about themselves that is accessible to others, informed consent attends more explicitly to the particular practices of disclosure and agreement that are present within a given design. Ongoing trends within manufacturing work increasingly rely on methods and tracking technologies that optimize worker activities. Such practices could begin to intersect with wearable AR systems, which would enable extremely detailed and invasive worker monitoring technologies (e.g., eye tracking, live video/audio recording). What types of tracking data will be gathered by the AR system (e.g., video feeds, task completion times, peer-to-peer communications, etc.)? Who has access to the data? How will the data be used to monitor and evaluate worker activities (e.g., performance evaluations)? Will employees be able to opt-in/out of this particular feature? Addressing such questions in depth would likely require further observation of workplace AR systems in various workplace contexts. However, technical designers can also take measures to protect workers’ privacy in workplace AR systems.

### Monitoring Layer - Design Recommendations
- Prioritize employee safety over productivity in data collection practices
- Limit the type and/or amount of user data that can be collected by the system
- Avoid default implementation of biotracking features that atomize worker bodies into discrete units (e.g., automatically gathering eye tracking data)

The document layer draws attention to the technical documentation designed to guide the integration of the system into various workplace contexts and practices. Drawing from the principles of ethically aligned design, designers should work to craft technical documentation for devices in ways that ensure “transparency as intelligibility” such that the users are able to easily access and understand the decision-making processes of the AR system with which they are interacting (Chatila & Havens, 2019, p. 182). This includes not only robust technical documentation for the device but accessible user-guides that clearly outline the particular technical capacities possible within the system being utilized (e.g., GPS tracking, eye-tracking, communications monitoring, etc.).

### Document Layer - Design Recommendations
- Create transparent technical materials outlining the data collection practices of the system
- Ensure that any automated features and/or decision-making processes of the system are transparent, intelligible, and easily accessible to the user for modification
- Include technical documentation outlining users’ rights to view, own, and modify their own workplace data
Craft technical documentation outlining exploitative or inappropriate applications of the technology within various workplace settings

Finally, the context layer considers the particular workplace policies, practices, and values that the AR system is designed to engage. The context layer encourages designers to not only consider specific technical features of the device but the broader workplace contexts in which they will be implemented. As mentioned in the introduction, industrial workplaces increasingly rely on objective performance metrics to monitor and evaluate employees, with some workplaces even utilizing gamification-based AR to further boost worker productivity (Ponis et al., 2020). These contextual factors are highly influential to how a workplace AR system is taken up and implemented within various industries. In particular, VSD attends to the contingent and relational emergence of values as they play out within a given technology’s situated use and application. Friedman (2004) noted: “Values are viewed neither as inscribed into technology nor as simply transmitted by social forces. Rather, value sensitive design believes both that people and social systems affect technological development and that new technologies shape (but do not rigidly determine) individual behavior and social systems” (p. 772). Consider efficiency, for instance, a value that is commonly touted in the design of workplace AR systems. Although utilizing AR headsets solely to maximize workplace efficiency may lead to fatigue or other forms of worker stress, at the same time, workers may also be invested in conducting their work more efficiently or adeptly through the affordances offered by wearable AR. The context layer encourages designers to more actively consider how an AR system is/will be deployed in disparate workplace contexts and to take meaningful measures to ensure that their designs are not being utilized in exploitative ways. Indeed, EAD further emphasizes the role of designer responsibility within emerging technological systems and encourages designers to take proactive measures in anticipating unintended or exploitative applications of their designs, regardless of designer intent (Chatila & Havens, 2019).

Context Layer - Design Recommendations

- Create protocols and policies for collecting anonymous survey data about worker experiences with wearable AR
- Specify how the system has been designed to influence their own (or others) behavior and be able to opt-out of these features if desired (e.g., gamification elements)
- Decommission devices, software, or services that are being implemented in ways that harm or exploit workers

These four layers are deeply intertwined and mutually influential to how wearable AR is enacted as a site of power (Slack et al., 1993, p. 28). Consider, for instance, how these layers might inform the role of eye-tracking within workplace AR systems. Here, various components of the context layer (e.g., workplace optimization, employee evaluation practices, etc.) potentially intersect with the monitoring capabilities of wearable AR (e.g., eye tracking software) to further “enhance” workers’ bodily practices into discrete data streams that can be coordinated alongside existing workplace procedures. As such, technical designers might engage with the interface and document layers to mitigate these exploitative possibilities, such as through UX/UI features that provide user access to any eye tracking capabilities or by incorporating technical safeguards and documentation that specify the contexts in which eye tracking will be utilized through the system (e.g., for safety purposes only). This is not intended as an exhaustive taxonomy of the actual complexities and power relations emerging alongside workplace AR systems. Rather, they are simply intended as a generative design framework for conceptualizing the ethical implications of wearable AR. Moreover, these layers encourage designers to approach AR design not as a collection of discrete processes or elements but as mutually constitutive flows within a constantly evolving informational system. In this case, these layers can help us interrogate how a worker’s ocular capacities become linked to the workplace in ways that make it recognizable as a site of potential meaning and data accrual (new modes of worker monitoring and surveillance, increased expectations for output, etc.). Indeed, designers must consider how wearable AR systems might contribute to the further discretization of workers’ bodies, fostering new sites of power that could potentially normalize and entrench exploitative workplace practices.

CONCLUSION

Wearable AR has the potential to revolutionize how knowledge is transmitted and circulated within a variety of industries and educational contexts. This emerging technological paradigm has potentially democratizing capacities for how we might learn and teach within more contextualized pedagogical scenarios, including workplaces. For instance, researchers have noted the potential of such technologies to mitigate workplace-related injuries by alerting workers to potentially damaging postures or the over-repetition of certain movements (Mengoni et al., 2018). In such cases, wearable technologies can be oriented to more ethical ends to promote employee safety and well-being. Although instructional AR systems may lead to more engaging and intuitive styles of learning, we should be wary of unreflectively adopting the transhumanist discourses surrounding the use of AR within industrial design contexts, particularly as it is increasingly marketed as a pathway to a more efficient and compliant workforce.

The ethical design guidelines I offer here work toward envisioning integrations of wearable AR that attend more capacious to worker-oriented values. In particular, by focusing on these design layers of workplace AR (Interface, Document, Monitoring, Context), designers can more adequately trace the complex, contextualized power relations circulating within workplace AR systems. Although my focus here is on industrial applications of workplace AR, designers must also consider how these systems will play out in other workplace contexts (e.g., retail, food service, construction, etc.). These disparate worksites impact the four layers of AR design in complex ways that require further investigation and design consideration.

Ultimately, wearable AR technologies will continue to become integrated into social and professional contexts in ways that are difficult to anticipate. As such, it is imperative that designers continue to remain keenly aware of not only the affordances of these technologies but their capacities to further entrench inequities across various workplace contexts. In this, our goal as designers is to foster new modes of critical engagement with wearable technology that surface unforeseen relationships between workers and these nascent systems of multimodal production, data collection, and informational exchange.


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Embodied Participation: (re)Situating Bodies in Collaborative Research

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ABSTRACT
Our paper centers embodiment as a theme and a process in research through describing the fine-grained practices and everyday interactions that shape collaborative research in the contexts of watershed restoration and environmental monitoring. We focus on embodiment because it offers a means for attending to the process and politics of knowledge production within and across boundaries. We offer two case studies that focus on embodiment to structure research processes and shape ongoing, emergent, and collaborative research practices. We argue technical communication as a field is well positioned to include embodied practices in research design and writing.

CCS Concepts
Human-centered computing, applied computing

Keywords
Genre, Embodiment, Rhetorical ecology, Interdisciplinary, Knowledge map

INTRODUCTION
"But it's just the smell of the ground and the equipment, the soil, the not being—there's always something new. We never get really sick and tired of doing anything in farming, because the jobs just don't last... But, like I said, we ship potatoes. We ship for most of the winter. And we're done shipping now. We're going to go work in the shop for a few months. And then we'll start cutting [potato] seed. And then you get on the ground and it's just about the time you get sick of doing something, a new job comes along. So, that's what keeps you going...."

— Interview with farmer working in the Meduxnekeag River watershed

We logged into the virtual map and typed in our ideas. Text boxes simultaneously popped up in different places on the canvas. "Oops," someone said while laughing and dragging a text box, "I didn't mean to bump into you." Another said, "I'm lost and not sure how to do this, can someone help me?" As the map filled with ideas, we asked each other: How are we thinking about eDNA? Is it a science? A tool? A technology? How is it connected to social sciences... history... ethics... and to whom... and for whom?

— Reflection from a participant in a knowledge mapping activity focused on eDNA

We open our manuscript with these passages because they deal with a foundational interest that guides work within our distinct research projects as well as our collaboratively-written piece here: how bodies are involved in work, research, and collaboration. Upon reading this opening sentence, we encourage readers to go back to the passages offered above and read them again; but, this time focus on bodies as they appear in the words. Consider how recalling the smell of soil or machinery is a necessarily embodied experience. Or how the dynamism of farm work as it moves bodies...
through different rhythms depending on the season is articulated as an energizing and important part of farming. Or how bodies are noticed and felt amidst the messiness of co-producing knowledge through movement, emergent questions, and practices of listening and sharing through knowledge mapping. Finally, we encourage readers to pay attention to how interactions with the passages above are embodied acts. Did re-reading require repositioning one’s body? Did the pace of reading change, to slow down and attend more thoroughly or at skimming speed? How was the body present in the act of engaging these words? Attending to these questions, and the presence of bodies and their/our relations with texts, is part and parcel of the work we describe in this paper.

We offer embodiment as a central concept that has guided both collaborative research projects we discuss throughout this piece. Embodiment, in this sense, refers to the myriad ways in which bodies—researchers, participants, partners, interviewees, and beyond—are foundational for research, writing, and collaboration (Clayson, 2018; Ellingson, 2009; Haas & Witte, 2001). We aim to show how these processes are fundamentally embodied practices, though research-based writing does not often acknowledge the role of bodies within the production of texts. As such, our piece is motivated by two guiding questions: how are bodies present, or not, in research; and, how might we start to cultivate ways of doing, participating in, and writing about for research that help us pay attention to bodies? To operationalize embodiment as a concept, the authors (Michael, Jen, and Bridie) reflect on research experiences that are helpful for positioning embodiment as both a theme and a process to highlight how the production of research is always-already embodied (Hawhee, 2009; Middleton et al., 2015).

Taken as a theme, embodiment becomes central to the research and interview questions we ask as well as the types of “data” we gather. For this, Michael and Bridie reflect on their project in the Meduxnekeag River watershed (hereafter referred to as “Meduxnekeag watershed” or “watershed”) as they worked with partners to design an interview protocol that asks participants—farmers—how the act of farming helps them shape relationships with land and water. This created a space for farmers to reflect on and share stories that position these relationships as deeply embodied which allowed us to trace how bodies, work, and farming rhythms shape what it means to farm in the Meduxnekeag watershed.

When we approach embodiment as a process, we acknowledge how the practices of research are embodied actions. This allows us to focus on the literal processes of participating in research, whether that be the preparation of texts/materials, co-producing knowledge, or moving through a field site. Myriad bodies perform and remember research through the development of specific deliverables for recording, writing about, and making sense of experiences. As such, the creation of research deliverables has implications for recognizing embodiment. As Sauer (2002) argued, though the very process of recording knowledge is embodied, it is common for recordings themselves to be prepared in a way that makes this invisible as bodies are written out of texts. For example, the knowledge map exercise that Jen and Bridie reflect on relies on these processes of embodiment as participants navigate and embody sharing ideas and shaping research by discussing, listening to and learning from each other, and organizing their knowledge visually on the map. However, without specific attention to the importance of embodied participation for that exercise, such a deeply embodied process for guiding the project may go unmentioned or underrecognized in final research reports, articles, and related deliverables. In both cases we describe in this paper, we focus on embodiment as a theme in the lived experiences of those who participate in our research. We also focus on the process of embodiment itself, emphasizing how we use what we learn to make choices about the ongoing practices of collaboration (McGreavy, Randall, et al., 2018).

We use an ethnographic and engaged methodology based on observations and qualitative interviews to build partnerships, participate in research, and co-produce knowledge (Graham et al., 2017; Lindenfeld et al., 2012; Rai, 2016; Wilson & Herndl, 2007). Our engaged rhetorical methodology orients us to the material, relational, strategic, and critical exigences in our collaborations (Druschke, 2018, 2019; McGreavy, Fox, et al., 2018; Middleton et al., 2015; Rai, 2016; Rai & Druschke, 2018; Wilson & Herndl, 2007). A rhetorical lens helps us attend to embodiment and what bodies are doing; changes in language and symbol use; the emergence of new terms, metaphors, and visuals over time; and the development of communication artifacts. By using specific genres, such as research presentations, technical briefs, and diverse visual images and diagrams, we regularly share findings with participants and partners, offering opportunities to modify or reshape shared communication practices (McGreavy et al., 2015). Such methodologies can be used to observe changes on a broader scale by connecting communication data and research with organizational changes via systems ethnography, qualitative modeling, and critical praxis (Graham et al., 2017; Wilson & Herndl, 2007).

We turn to embodiment to position our work within a larger network of scholarship that connects participatory and community-engaged research with increasingly complex questions at the intersection of conservation, climate change, and environmental justice (Blythe et al., 2008; Druschke, 2018, 2019; Druschke & McGreavy, 2016; McGreavy et al., 2022; McGreavy, Ranco, et al., 2021). Embodiment becomes a guiding concept for our methodology as we aim to build a case for how technical communication scholarship can attend to bodies in research processes. We must find ways to lean into research designs that can address differences in forms of knowledge and disciplinary expertise and recursively shape the ongoing production of knowledge for particular, situated, and multiple purposes. Attending to questions of embodiment becomes central for this pursuit, in part because such questions offer a means for reflecting on the power relations and politics of knowledge production within and across disciplinary boundaries (Freeth & Caniglia, 2020; MacMynowski, 2007; Moosa-Mitha, 2005). For instance, Michael and Bridie’s work in the Meduxnekeag watershed responds to the conservation needs and goals of our community partners as they relate to farming communities and practices, water quality, and soil. And Jen and Bridie’s work on the Maine-eDNA (environmental DNA) project acknowledges and responds to the intensification of social and environmental precarities occurring along the Gulf of Maine which is warming faster than most of the world’s oceans (Pershing et al., 2015). These patterns are the overarching and ambient catalysts that guide our cases.

We operationalize embodiment to argue that focusing on bodies in these contexts matters because it is through our embodied interactions with the world that we are called into responsible relationships with it. As Propen (2018) argued, it is the “ongoing intra-actions of … bodies, technologies, and worlds [that call for] ethical responsibility and … compassionate conservation” (p. 32). Focusing on embodied interactions within our cases, such as the relationship between farm work, soil, and water or collaborative
procedures of knowledge making, asks us to focus on how bodies (human and non-human) are present with each other and are mutually constitutive of each other. This read on bodies calls on researchers to (re)consider responsibility, and how we discuss, or don’t discuss, bodies in conservation, climate change, and environmental justice work. Attending to how bodies come to matter is important for responding to the complexities and entanglements of social and environmental precarities emerging amidst climate change.

Furthermore, a focus on embodiment allows us to respond to an exigence that emerged within the transdisciplinary projects we discuss throughout our paper: a positivist paradigm built on logics of objectivity and detachment. We argue that such logics, as they guide scientific research, are ill-equipped to attend to the complex issues mentioned above (Freeth & Caniglia, 2020). Although there has been ample scholarship critiquing and offering alternatives to a positivist paradigm, in our experiences in science-based collaborative projects, positivism and its relatives remain alive and well. It’s thus important to pay attention to this paradigm in the context of transdisciplinary research that aims to connect scientific work with communities and community partners. As we discuss, a focus on embodiment enables this by calling researchers to attend to practices and politics of knowledge production within diverse teams as well as the types of data that research aims to create, share, and use.

A POSITIVIST PARADIGM AS EXIGENCE

How did embodiment come to matter for us in our respective research projects? To begin to address this mattering, we start by situating our research projects as they relate to, and differ from, positivistic research approaches and perspectives. Positivism came to matter for us because the logics associated with this paradigm constituted important exigencies within both of our projects, and especially the influence of logics of objectivity and detachment. Though positivism does not exert the kind of control over research that it once did, positivistic logics are still alive and well in scientific research (Anand et al., 2020; Kuhn, 1996) which has implications for transdisciplinary research involving diverse and interdisciplinary partners (Eigenbrode et al., 2007; Pohl & Wuelser, 2019; Nurius & Kemp, 2019). Drawing from Lincoln and Guba (1989), we define positivism, and its corollary post-positivism, as:

> fundamental ontological premise that there is an actual reality, a ‘way things really are,’ that can be discovered (converged on) by the methods of science...scientists, in their work of discovery and determination, must be objective...assume a detached stance so that they will not influence the outcome of the inquiry nor allow their values...to affect the results. (pp. 223–224)

Following this definition, paying attention to positivist logics in transdisciplinary research directs our attention to embodiment in collaborations in at least two ways. First, positivistic influence on research design processes constrains attention to embodiment in the types of data collected and in the processes used to generate knowledge within collaborative research contexts. This has important epistemological implications for how positivist logics influence commitments in research design by calling for accurate measurement and reporting of an objectively fixed, knowable, and external world (Brown & Strega, 2005; Haraway, 1988, 2016; Smith, 2021). This paradigm also shapes work across the social sciences by replicating logics of detached and objective measurement in “human subjects” research (Brown & Strega, 2005; Ellingson, 2009; Madison, 2005; Miller, 1979; Sauer, 2002) and then attempting to accurately communicate those findings as objectively as possible (Druschke & McGreavy, 2016; Sauer, 2002). Within such a process, there is little room for attending to embodiment, as the myriad bodies involved in research are often made invisible as a means of yielding “deceptively tidy accounts of research” (Ellingson, 2009, p. 35).

Early on in Michael and Bridie’s work in the Meduxnekeag watershed, much of the project focused on identifying barriers to motivating farmers to install riparian buffer strips on farmland bordering the tributaries throughout the watershed. As a result, project goals sought to develop and use data to promote “behavior change” in farmers, including efforts like financial incentives, technical assistance, or education about buffers. This early focus on discovering information about farmers and then using that to motivate behavior change follows logics of objectivity and measurement within a positivist paradigm. The focus on detached discovery limits the capacity for approaching research as a process of relationship building or for facilitating collaboration in the Meduxnekeag watershed. However, through commitments to embodiment, this project in the Meduxnekeag watershed shifted to describe farmers’ relationships to soil, water, and the rhythms that guide their farm work. Instead of detached assessment and behavior change, our focus on embodied relations of farming facilitated partners’ capacities for, and sense of value in, building relationships with farmers as a part of future conservation work in the watershed, riparian buffers included.

Second, embodiment offers a powerful framework for highlighting and working against a positivist paradigm focused on covering over bodies in research or otherwise ignoring them. More specifically, attending to embodiment as a theme and process within research offers opportunities to work against a positivist paradigm through the ways that we design, collaborate, and write about/within research. This perspective resonates with Kuhn’s (1996) keystone articulation of paradigms within science. Paradigms develop within scientific research to define logics and values associated with research, including the types of prioritized theories, desired knowledges, and methods employed (Kuhn, 1996). Although such paradigms are useful in how they enable precision and can aid in the identification of material evidence to support argumentation, they can also become constraining in how they establish norms for what counts as science and knowledge.

To address positivism as an exigence within our transdisciplinary and engaged research, we turned to theories drawn from rhetoric, technical communication, and sustainability science to work with interdisciplinary concepts such as boundary objects, rhetorical ecologies, and genres. These concepts are significant across these fields and have been formative for how we approach embodiment as a theme and process. We draw on Proven’s (2018) call for resituating environmental and conservation work so that it is less about “managing or controlling bodies in the natural world” (p. 1) and more focused on the ways that we can embody more caring and compassionate relationships with proximal bodies we exist alongside. Similarly, scholars such as Haraway (1988, 2016), Alaimo (2016), and Barrad (2007) have asked us to attend to how myriad bodies do not have neatly delineated boundaries capable of
EMBODIMENT AS A PROCESS IN TRANSDISCIPLINARY COLLABORATION

We start with the Maine-eDNA project as an example of a large transdisciplinary project because it consists of more than one hundred participants with diverse disciplinary and knowledge backgrounds who work among nine geographically-distant partner institutions and with multiple community partners. Through a collaborative approach that is also guided by a governance document, our communication research team pays attention to differences in understandings of research, decisions about what “deliverables” are important, and how knowledge is co-produced and applied across contexts (Darbellay, 2015; Wilson & Herndl, 2007).

This project is timely given how collaborative approaches to research, and especially transdisciplinarity, have increased over time (Darbellay, 2015; Stokols, 2014). We define transdisciplinarity, as a commitment to produce knowledge in ways that connect across disciplines and to design knowledge that can make a difference with and for situated communities through societal and/or policy-related decision making (Hall et al., 2019; Klein, 2014; McGreavy et al., 2022). Knowledge co-production is a related approach that is both a theoretical framework for how to conceptualize the relationship between knowledge and social order as well as a set of practical commitments that guide how collaborative research should be conducted (Jasanoff, 2004; Norström et al., 2020; Tallbear, 2013; Tengö et al., 2014). This context enables us to focus on communication practices that foster collaboration such as commitments to active listening, working through tensions that emerge from differences in language and worldview, fostering empathy, and spending time and laughing together because they are deeply embodied and interactional (Nurius & Kemp, 2019; Thompson, 2009). As Bloomfield et al. (2020) suggested, “human bonds matter, maybe more than the information underlying people’s views, in helping people to collaborate” (p. 388).

As such, the Maine-eDNA project offers an opportunity to focus on fine-grained embodied practices among collaborators and how they provide communication researchers with a sense of how communication, as an embodied process, shapes transdisciplinary collaboration. For example, it is one thing to say that it is important to listen across differences in perspective and quite another to uphold and demonstrate that commitment, especially when what listening means varies by context and across cultures (Cooke & Hilton, 2015; Druschke & McGreavy, 2016). The heightened presence of difference between collaborators in an interdisciplinary research context offers ways to (re)focus on embodiment as a process through how those differences are felt and navigated by participants. Within the Maine-eDNA project, knowledge mapping emerged as a practice for co-producing knowledge across differences. Furthermore, knowledge mapping offers an opportunity to bring embodiment into focus in our project as well as help facilitate a paradigm shift that decenters and deemphasizes positivist logics.

We define knowledge maps as “visually oriented aids” (Dilevko & Soglasnova, 2013, p. 143) that have been used for decades by disciplines such as education, psychology, business, information technology, and communication to convey complex visual information (Huang et al., 2021; Kim et al., 2003; Vail, 1999; Wiegmann et al., 1992; Wilson & Herndl, 2007). Some knowledge maps, such as textbook illustrations or visual lecture aids, are shared as one-way streams of information from sender to receiver in which the recipient decodes and interprets the map (Wiegmann et al., 1992). In the eDNA project, we approach knowledge mapping differently from the aforementioned model by drawing on a collaborative approach where the map is co-produced by a community of interdisciplinary participants who seek to identify different meanings of core terms within a project and find ways to acknowledge and value diverse perspectives (Wilson & Herndl, 2007).

As a collaborative activity, participatory knowledge mapping facilitates opportunities for boundary spanning and connection across differences (Graham et al., 2017; Wilson & Herndl, 2007). Within our own project, the knowledge map proved useful in the early stages of our project-based collaboration by providing a “communication device” that identifies diverse forms of knowledge and fosters connections for transdisciplinary learning (McGreavy et al., 2013, p. 4199). As a part of this, our team designed and facilitated a virtual knowledge mapping workshop that included reflective writing practices that generated conversations between Science of Team Science (SciTS) working group participants as they related their knowledge to eDNA science. Through guided conversations, this workshop explored the messiness of language and technology by attending to multiple disciplinary and partner perspectives in an attempt to define eDNA. Though participants often refer to eDNA as a material component (the genetic material left behind by an organism in its environment), they also define it “as a science, a tool or technology, and as a communication process” (McGreavy et al., 2022, p. 5). The knowledge map can be used to foster an awareness of what a project means to participants, highlight how those meanings may be different from each other, and help collectively identify where the knowledge making effort may be headed. Beyond this, the map can be synthesized with future information we collect to be formed into a systems model to share with project participants (Graham et al., 2017; Wilson & Herndl, 2007).

Knowledge mapping provided participants physical and verbal opportunities to make linkages around the concept of eDNA and to engage in dialogue about people’s perceptions, ideas, and differences. As our workshop facilitator said, “There is no single right way” to do knowledge mapping given that the map can be modified and revised over time but also allows participants to remain rooted in their discipline while working across boundaries. As Wilson and Herndl (2007) noted:
as a boundary object, the knowledge map recognizes difference and division, but it also provides identification across the sites of action...the balance between division and identification allows the knowledge map to function as a boundary object that encourages integration rather than demarcation. (p. 138)

From the knowledge map, a discussion emerged about relationships between several topics, questions, and eDNA-related issues. For example, a participant noted that eDNA science and knowledge integration requires a multi-disciplinary approach which could be compared to forensic science and its use to reconstruct a crime scene. Another participant mentioned struggling to unlock thinking about eDNA, but when the group talked about eDNA as one type of “thing” and technology as another, this discussion allowed the group to begin to approach eDNA as multiply arranged in the context of environmental science. The participant noted the knowledge-sharing process was interesting: to be locked up on something and then, through the group’s dialogue and mapping, be able to add and draw new connections about a concept.

Another participant noted several important social, political, or economic issues and questions about eDNA such as: for what or whom is eDNA a tool, and to what ends? The participant noted the project may be missing social science and humanities expertise that more fully considers history and ethics. The group also discussed how the co-production of knowledge helps us consider ethical issues associated with how we form relationships and practices through research.

Knowledge mapping not only gives participants space to “communicate across differences” (McGreavy et al., 2013) and move beyond their own boundaries toward cooperation (Wilson & Herndl, 2007), but it also affords engaged communication researchers opportunities to witness, be part of the shaping of, and make sense of the embodied collaboration practices at work. For example, the use of metaphors such as forensic science, were used by participants as a way to communicate the complexities of defining eDNA science (see Figure 1, “Example: Forensic Science,” white box, upper right). Our team also noticed the forensic metaphor used in our semi-formal interviews (n=15). These combined findings informed further research into exploring the links between eDNA, crime, forensics, and how participants use metaphors made popular through television crime shows such as CSI (Crime Scene Investigation). This connection opened up continued critical reflection about how to make sense of eDNA science and the power-related implications of crime-based metaphors, especially in light of how eDNA science could be used to further regulate activities, such as fishing or related to water quality, that increase the risks of criminalization for those whose livelihoods intersect with those regulations (McGreavy et al., 2022).

From the knowledge map activity, our SciTS team presented the data at various meetings to gauge project-wide interest in pursuing discussions about ethics. Overwhelmingly, Maine-eDNA project participants expressed interest in future sessions that would strengthen the project-wide focus on ethics. As a result, the SciTS team led an ethics presentation and discussion at a bi-annual project-wide gathering in 2020, ethics frameworks and training approaches were added to the spring 2021 University of Maine “eDNA Fundamentals” graduate course, an ethics workshop was offered in summer 2021, and a follow-up set of ethics questions was included in a project-wide communication survey.

Such conversations foreground embodiment by highlighting how engaging in dialogue, working collectively on activities such as knowledge maps, co-producing new ideas from discussions, and struggling through the tensions and frustrations of not having concrete answers take place through embodied participation. During the workshop, participants became aware of the necessarily messy and embodied processes involved in co-producing something as seemingly simple as a collective definition of eDNA. Practices of active listening, patience, sharing, reflection, and shared laughter fostered a collaborative atmosphere within the workshop precisely because they rely on embodied participation with others (Bloomfield et al., 2020; Nurius & Kemp, 2019; Thompson, 2009). Such commitments create space for participation and voice, especially those who may be less inclined to vocalize their ideas. From this commitment, ethics emerged as a key theme as the need to strengthen the focus on ethics was fostered by the inclusive discussion space (Norström et al., 2020). Through writing and

Figure 1. Representation of Maine-eDNA SciTS participatory knowledge map (Smith-Mayo produced in collaboration with Maine-eDNA SciTS WG, 2021)
conversation, embodiment became central for the knowledge mapping workshop while the task of defining eDNA slightly receded. This movement allowed bodies, human and non-human, to be noticed and included in discussions of how to practice eDNA responsibly and allowed iterative topics such as ethics to flow more freely out of the collaborative work and inform the larger project.

Finally, focusing on knowledge mapping and co-production as embodied processes that require diverse perspectives and forms of participation also deciphers positivist logics at play in the Maine eDNA project. What eDNA is, and how it ought to be used, was defined through the interplay of participants embodying practices of listening and collaborating with each other. Participants, as well as ideas, processes for doing eDNA work, and other parts of the project are thus transcorporeal (Alaimo, 2016) in how they give shape to each other through collaboration. As noted previously, positivist logics focused on neat definitions and objective analysis are poorly positioned to recognize this work, much less mobilize it as productive, transdisciplinary practice.

EMBODIMENT AS A THEME IN ENGAGED RHETORICAL RESEARCH

Turning from the focus on embodiment as a process for facilitating collaboration in transdisciplinary eDNA research, we offer embodiment as a guiding theme in our work in the Meduxnekeag watershed. We turn to embodiment as a theme to assist us in designing and reflecting on an engaged rhetorical research project that grew out of a thirty-year collaboration among our community partners—the Maine Department of Environmental Protection (MDIPE), the area’s Soil and Water Conservation District (SWCD), and the Natural Resources Conservation Service’s (NRCS) local field office, and the Natural Resources Department for Houlton Band of Maliseet Indians (HBMI) whose tribal lands and ancestral homeland is located within the Meduxnekeag watershed—and their interest in better understanding why farmers in the area use some best management practices (BMPs) and not others. In particular, our partners asked whether or not farmers describe riparian buffer strips as an important BMP for fields that border tributaries throughout the watershed.

As a part of attending to embodiment as a theme in our work in the Meduxnekeag watershed, we adopt an engaged rhetorical methodology (Drusche, 2013, 2018; Middleton et al., 2015; Rai & Drusche, 2018). We sought to characterize how farmers describe their farming practices and what values guide those practices, how farming shapes their relationships to land and water within the watershed, and what BMPs they find useful, or not, and why. Our development of such an engaged rhetorical methodology is guided by two theoretical frameworks within rhetoric: rhetorical genre studies and rhetorical ecologies. These frameworks highlight how embodiment, as a theme, can shape research question design, and how research makes future projects possible.

Rhetorical genres offer a framework for better understanding how research experiences are generic in how they are shaped by specific norms or paradigms (Bawarshi, 2000/2018; Campbell & Jamieson, 1978/2018; Miller 1984/2018). We borrow Miller’s (1984/2018) argument that, “what we learn when we learn a genre is not just a pattern of forms or even a method of achieving our own ends. We learn, more importantly, what ends we may have” (p. 51). Miller’s argument that genres shape not only our research processes but also what ends we see as possible for research to strive towards provides a powerful lens for attending to how research genres can reinforce, or challenge, dominant epistemologies and ideologies. Paré (2002/2018) exemplified this when he argues that “as habitual practices, genres serve as one of the chief forces in … the ‘naturalization of ideology’” (p. 185).

Given the ideological power of rhetorical genres for shaping action, this perspective is helpful for showing how embodiment as a theme is often suppressed or precluded by the form or process of research through logics of objectivity and detachment that constitute positivist research genres. However, rhetorical genre studies also articulate genres as performative in that they are not static or settled in how they organize social action. Rather, as Bawarshi (2000/2018) argued, genres do not simply precede decisions we make but are “reproduce[d] as we function within [them]” (p. 179). Put another way, though genres play a role in organizing how we participate in social action, those actions can both maintain or change the shape of genres, their organizational logics, and the types of social action they enable.

This understanding of genres as both shaping social action but also being shaped by that action connects with another important concept and area of scholarship that has emerged in the field of rhetoric, namely rhetorical ecology. Rhetorical ecologies attend to how environments—i.e., the contextualized particular places of the everyday—shape rhetorical capacities (Drusche, 2019; Edbauer, 2005; Ewalt, 2018; Rai & Drusche, 2018; Stormer & McReavy, 2017). As Ewalt (2018) put it, the everyday contexts within which we live and work are themselves ecological and rhetorical arrangements that shape or invent potential futures or actions that can emerge. Ewalt refers to these as “inventing arrangement[s]” (p. 154) that are informed by the very arrangements, actions, and understandings they produce. Drawing from articulation theory, Ewalt posited that these inventing arrangements can be recursive in how the products of such an arrangement enable the continued production of similar arrangements, outcomes, or actions.

Given this perspective, rhetorical ecologies help highlight the way genres shape situations (e.g., engaged research or farm work in a watershed) as well as ways that we may work to intervene in those situationsgenres in an effort to promote alternative outcomes or actions they make possible (Drusche, 2018; Ewalt, 2018; Grabill et al., 2018; Jung & Sharp-Hoskins, 2018). Rhetorical genre studies in tandem with rhetorical ecologies allow us to attend to the ways that matter comes to matter as well as how we can “intervene…and participate in creating the conditions of possibility for how matter can come to matter (differently)” (Jung & Sharp-Hoskins, 2018, p. 175). Thus, we understand intervention as an opportunity to change what these inventing arrangements produce in order to change what arrangements become possible in the future (Ewalt, 2018).

As applied to our work in the Meduxnekeag watershed, rhetorical ecologies and genres guide how we attend to embodiment as a theme. In this project, our early conversations about defining project goals were focused on understanding why farmers in the watershed were not adopting buffers as an important BMP in the hopes of shaping education, technical assistance, and resources to overcome these barriers. This focus shifted slightly once we were able to interview each project partner individually. Partner interviews allowed us to ask each partner what they wanted to become possible in the project and to identify some of the larger issues they were interested in addressing. Through interviews, we learned that, along with finding ways to motivate farmers to install
riparian buffer strips, our partners were also interested in broader goals such as better understanding farmer values, how farmers perceive their relationship to the Meduxnekeag watershed, how farmers define riparian buffer strips on their own terms, the borders of the “farming community,” and what farmers see as priorities for restoration and partnerships within the watershed.

We connect this example with the recursive and performative nature of genres because our collaborative work in the Meduxnekeag watershed is a prime example of reshaping genres through embodied actions. Instead of designing a positivist-inflected social science research project interested in developing an objective and detached understanding of the barriers farmers face in establishing buffers, we designed a project, and adopted a rhetorical methodology, capable of highlighting and discussing some of the embodied, mundane, and everyday values and rhythms that guide farming. For example, our interview protocol (Figure 2) consists of questions we created with our community partners that aim to develop a better sense for how farmers describe their understanding around BMPs. Other questions ask farmers to reflect on themes such as: defining farming community boundaries; perceptions about farmers’ connections to the land and how farming as a practice constitutes connections to the land; the watershed’s various borders (e.g. field edges, tributaries bordering fields, etc.); and what it is about farming that moves them, not only on an emotional level, but literally plays a role in inducing motion, as work or play, in their bodies.

We used this interview guide to conduct 17 virtual and in-person interviews with farmers in the watershed. From those interviews we then scheduled field visits (n=5) with farmers that put rhetorical field methodologies (Middleton et al., 2015; Rai & Druschke, 2018) into practice by asking farmers to walk us through the topics we discussed during the interviews. This helps contextualize conversations in interviews by providing researchers with firsthand experience moving through farming operations. For example, instead of just discussing the excitement and value farmers attach to soil health practices, researchers were able to walk with farmers through the embodied, everyday processes associated with that work and show us the steps they take to promote the health of their soil and take care of their farms.

Taking this approach allowed our project to develop a more thorough understanding of the perceptions, needs, and values of farmers in the Meduxnekeag watershed so that our partners can connect to these through future conservation-based decision making and policies. We also highlight how these perspectives and values emerge or take shape within the mundane, everyday embodied experiences of farmers (McGreavy, Fox, et al., 2018; Rai & Druschke, 2018). Whether or not farmers find proposed best practices or projects compelling depends in part on whether those practices can connect to the everyday lived experiences, values, and processes of meaning making farmers constitute and negotiate. In many ways, we are asking farmers about the rhythms that move them, or guide their farming, in the watershed. This use of rhythm follows Hawhee (2009) and Burke (1935)—as ways to attend to how nonsymbolic motion and symbolic action come together to move bodies with purpose or understanding. By asking farmers to articulate how the act of farming helps them shape relationships with land and water, or by asking them to reflect on whether or not the larger backdrop of the watershed and its boundaries influence how they farm, we are directing our findings and data towards tracing how the acts of farming and associated meaning making are embodied. For instance, one of our key findings describes the importance of caring for soil as central to how farmers relate to, make decisions about, and find value in land and water throughout the Meduxnekeag watershed. We include a quote (Figure 3) from an interview with a farmer that we shared with our partners in a final technical report that helps show how some farmers’ relationship to water is constituted through their relationship with soil. Put another way, many farmers make meaning of water not through direct relationship with the Meduxnekeag river but through the interconnectedness of water and soil.

"So, again going back to what we were talking about, I want to build my soil. I want to keep everything that I have here. I want to keep it here. So, I don’t want it washing down the brook. I don’t want it going down into the Meduxnekeag watershed. Am I necessarily thinking, at that point in time, am I necessarily thinking about the Meduxnekeag watershed, not necessarily. At that point in time, I’m just thinking about keeping my soil here.”

"Absolutely, yeah. We were put on this earth to take care of it and part of taking care of it is using it but using it to use it not use it to abuse it. So...I mean farming is taking care of the land if you’re doing it right. If you’re not farming to take care of it correctly...there’s only 2 ways to go with soil: you’re either building it, you’re either helping it, or you’re hurting it--there’s no middle ground at all.”
Throughout the interviews, farmers expressed a responsibility to care for the soil (Figure 4) as well as financial and economic pressures or forces that were in tension with that responsibility. This tension can be an opening to collaborate with farmers to develop projects capable of acknowledging, working within, and seeking to address those competing pressures or forces.

Furthermore, some farmers also describe the tributaries throughout the Meduxnekeag watershed as a common resource that everyone should have access to and are also responsible for trying to take care of. This helped characterize how farmers describe and embody participation in “community” as it relates to the watershed. This insight can be used to (re)constitute boundaries within the watershed, helping to identify myriad boundaries as potential sites for productive collaboration that could reconstitute boundaries between different communities (Druschke, 2013, 2018; Rai & Druschke, 2018; Wilson & Herndl, 2007). For instance, throughout our interviews some farmers acknowledge that they would like to use the Meduxnekeag River—or its tributaries throughout the watershed—to irrigate their crops. They also acknowledge that the watershed spans multiple communities who have multiple perspectives and values on how it should be used as a resource and/or cared for. As such, the Meduxnekeag watershed itself becomes a boundary-object capable of putting competing, nonetheless co-existing, perspectives into conversation with each other (Druschke, 2013, 2018; Wilson & Herndl, 2007). The interaction between these different perspectives offers an opportunity for collaborative work between communities for how the watershed can be cared for, as well as useful for, multiple communities.

By taking an engaged research approach that amplified a thematic commitment to embodiment, we were able to move from a narrow focus on riparian buffers to more complex relationships between soil and water as well as myriad boundaries that shape social actions and potential for collaboration in this region. Taking an engaged rhetorical approach, informed by embodiment, shaped the types of questions we asked farmers as a part of interviews and thus what became meaningful as data, including embodied experiences with farmers and the land. In sharing insights with our partners, our project influenced the types of future projects or research that partners are now identifying as possible and worthwhile in the Meduxnekeag watershed. For instance, during the presentation and discussion of our final report, partners discussed the value in building relationships with farmers not solely for educational purposes or to provide technical assistance, but to create capacity for mutual learning, collaborative decision making, and problem solving around water quality issues in the watershed. Similarly, during the discussion, partners reflected on a need to further refine and define riparian buffer zones so that they take into account the values and relationships to land and water farmers articulated.

This embodied, engaged approach helps to change the genres that guide working relationships and a sense of possibilities in the Meduxnekeag watershed. Instead of working relationships guided by logics of positivism that are focused primarily on education or technical assistance, this approach to research helped to promote conservation projects oriented towards maintaining, building, or improving relationships among community members. Although these perspectives on conservation work do not necessarily lead to quantifiable or easily identifiable outcomes, they do follow what Edbauer (2005) described as a “logic of generative research … that takes circulation of effects as an aim” (pp. 21–22) as opposed to the primary aim of research being the production of a particular end or outcome. Ultimately, the focus on embodied relationships to soil and water that farmers discussed allowed our research to enhance capacities for building relationships between our partners working towards conservation and farmers in the Meduxnekeag watershed.

WRITING AS AN EMBODIED PRACTICE

When guided by studies of rhetorical genres, ecologies, boundary objects, and practices of knowledge co-production, embodiment as a theme and process in collaborative research provides potentially powerful ways to intervene in everyday life as it is continuously shaped and reshaped through rhetorical participation in it. As both Paré (2002/2018) and Haas (2007) have made apparent, the production of texts—both in their content as well as the process of putting them together—play important roles in these rhetorical situations. A focus on writing is valuable for projects such as ours as a means to acknowledge and develop research capable of attending to embodiment in ways that can challenge positivist paradigms that may guide transdisciplinary collaborations. As such, rhetorical and technical communication scholarship offers key methods for working to reshape genres by attending to how communication shapes complex forms of collaboration (McGreavy et al., 2022; Paré, 2002/2018).

As a part of this, our projects foreground an approach to writing that acknowledges how texts are embodied in their production as well as ecological in their circulation and relationship to each other. As both Haas (2007, 2012) and Spinuzzi (2012) articulated, texts are interconnected through broader textual ecologies. Texts are thus a product of particular contexts as well as tools for recursively changing those contexts. Texts are also ecologically connected to one other. For example, within the Meduxnekeag watershed, the ecology of texts includes how the interview guide (Figure 2) led to the creation of other texts like interview transcripts and ultimately culminated in a technical report to be shared with our partners. So, given the capacity for texts to change the contexts within which they are produced, writing becomes an act that is full of responsibility in its capacity to shape research practices and highlight embodiment in those practices (Miller, 1979; Reynolds, 2007).

We argue that the process of writing is always rooted in some particular embodied context; a context that is physically inhabited by one’s body (Brooks, 2008; Madison, 2005; Reynolds, 2007; Weate, 2003). The farther back we trace the ecology of a given text, the more we see embodiment playing a role (e.g., hearing, seeing, and speaking information). An ecological framework for writing necessarily engenders an understanding of the integral role of embodied context in the assembly of texts. As Madison (2005) argued, writing is a performative and deeply embodied act in that “the body writes…[and] meanings and experiences in the field are filtered and colored through sensations of the body—that is, through body knowledge…in writing from our body, we are writing…of our embodied space and impressions” (pp. 195–196). Put simply, there is no text that is disconnected from the context from which it was created. In this way, the process of writing and the texts such processes produce are always already embodied through the physical and collaborative processes of writing or assembling information. Embodied and ecological contexts are woven into texts whether research acknowledges that embodiment or not.

Furthermore, texts that are prepared within collaborative and
transdisciplinary research contexts can be understood as boundary objects in how they help collaborators notice, name, and navigate differences. As noted above, early discussions of the eDNA knowledge map (Figure 1) focused on the multiple definitions participants used to describe eDNA. However, as the knowledge map shifted and grew, so too did the discussions about eDNA. Instead of only focusing on how to define eDNA, participants began considering how to practice eDNA science responsibly and ethically with diverse communities. Put simply, we posit that the boundaries of what eDNA science means to participants shifted and changed as they worked to define what eDNA science is and how it ought to be practiced through mapping. We argue that the very embodied and collaborative writing practices involved in assembling the knowledge map are what made this possible. The map itself is an ecologically-entangled suite of texts, in the form of multiple boxes with diverse connections, that visualize the boundaries between these concepts. At the same time, visualizing those boundaries also facilitated participants’ ability to work across them to forge new relationships between them and co-produce knowledge and meaning.

Additionally, these embodied practices of writing have played an important role in shaping our projects amidst the COVID-19 pandemic. Within Jen and Bridie’s work on the eDNA project, this meant navigating the assembly of a knowledge map, and the embodied processes of knowledge co-production, virtually. This means locating ways to listen to each other and connect ideas on the map while dealing with the affordances and constraints of a real-time digital mapping software, such as talking over each other, bumping into each other’s text boxes, or getting lost within the extensive canvas area. Within Michael and Bridie’s work in the Meduxnekeag watershed, most of the work for the project has taken place at a distance through the asynchronous preparation of a network of research texts that have shaped and guided our work. Most of these texts (a grant proposal, IRB application, interview protocol, briefs and technical reports, etc.) have been written, shared, collaboratively edited, and discussed from a distance using tools such as Zoom, email, and Google Workspace.

Across both projects, focusing on these writing practices is important for attending to embodiment as a theme and process. More specifically, our collaborative approaches to creating and editing such a network of texts—as well as the way they ultimately informed the direction of our projects—help exemplify Madison’s (2005) concept of embodied and performative writing. Creating and editing those texts became one of the main processes by which a “relational dynamic” (Madison, 2005, p. 193) was formed between partners and participants on each of these projects. As such, this network of texts has played a formative role in deciding how to collaboratively define, design, conduct, and participate in these projects. Articulating embodiment as a process that unfolds within writing shows how the creation and maintenance of multiple texts can be thought of as a network of boundaries. Such networks give shape to how we attend to, and participate in, research and what ends that work makes possible. Thus, we position the creation of networks of texts as a key opportunity for (re)shaping how bodies show up in research designs, interactions, and writing. Our shared research experiences provide fine-grained details about the practices that constitute embodiment as a theme and process, and how research genres, research and interview question formation, and boundary practices like knowledge mapping center embodiment in ways that can (de)center positivist paradigms. To this latter point, two questions remain: in the context of myriad social-environmental changes, how does embodiment make a difference and how do these commitments come to matter; and, what role does technical communication play in facilitating those commitments?

To understand how embodiment comes to matter, we can look to the consequences of a history of embodiment not mattering—especially within research contexts and what that research makes possible. As we have argued above, there has been an historical and ongoing commitment to positivist paradigms built on values of objectivity and detachment within biophysical and social scientific research. Although these values have been useful for allowing research to follow focused paths (Kuhn, 1996), these values close down modes of attending to the consequences of their own commitments. Returning to Lincoln and Guba (1989), they noted: “[positivist] presumptions about the nature of reality reinforce—and indeed require—treating human subjects as though they were objects. Objectifying human beings in the process of searching for ‘truth’ has led … to the depersonalization and devaluing of human life” (p. 224). It is this commitment to objectivity and detachment that motivates depersonalization and devaluing because there is a lack of embodiment within such methodologies.

Embodiment matters in scientific research contexts in part because ignoring embodiment within positivist paradigms entails a lack of ethical consideration for ‘human subjects.’ As others have argued (Burke, 1935; Davis, 2010; Hawhee, 2009) ethics is fundamentally embodied because it is only through our relationships with things, through our embodied presence with them, that we are called into ethical response-ability and relations (Davis, 2010). Put another way, our embodied interactions with entities (people, soil, water, knowledge, etc.) is what allows those to come to matter. Through relational entanglements, we come to understand myriad bodies not as distanced or devalued objects of study but as active entities within ecologies that are mutually influencing and through which we become trans-corporeal (Alaimo, 2016; Haraway, 2016; Proven, 2018).

This argument has important implications for technical communication. The rhetorical genres that shape research are a fundamental site through which particular types of action within research are undertaken and normalized. One place where these genres exert influence is within the realm of research writing. Through our reflections, we have attempted to structure such writing practices so that they can attend to embodiment as both a theme and process by which research is undertaken. Michael and Bridie’s work in the Meduxnekeag watershed has helped center embodiment as a guiding theme for the types of conversations we are having—and setting our partners up to continue having—with farmers. Jen and Bridie’s work on the eDNA knowledge map

**CONCLUSION: A CALL FOR TECHNICAL COMMUNICATION**

In the cases described above, we introduce how a thematic and processual focus on embodiment can challenge positivist logics of objectivity and detachment in research by (re)shaping how bodies show up in research designs, interactions, and writing. Our shared research experiences provide fine-grained details about the practices that constitute embodiment as a theme and process, and how research genres, research and interview question formulation, and boundary practices like knowledge mapping center embodiment in ways that can (de)center positivist paradigms. To this latter point, two questions remain: in the context of myriad social-environmental changes, how does embodiment make a difference and how do these commitments come to matter; and, what role does technical communication play in facilitating those commitments?
centers embodiment as a fundamental process apparent within research and facilitates opportunities for continuing to attend to such processes by highlighting how the work was, and continues to be, influenced by processes such as knowledge mapping.

Given this approach to writing, technical communication scholarship becomes a way to attend to myriad ecological and embodied factors by seeking to preserve them throughout the research process instead of allowing them to be written out and rendered invisible. Specifically, technical communication, and its focus on research design, process, and writing practices, offers a way to reshape research genres by including embodiment in writing and texts prepared as a part of research. Miller’s (1979) argument for teaching technical writing as “an understanding of how to belong to a community” highlights the capacity of technical communication scholarship to (re)shape research “communities” (p. 617). Further, Miller (1979) argued that technical writing and communication scholarship should “present mechanical rules and skills [for writing and research] against a broader understanding of why and how to adjust or violate the rules … and of the ethical repercussions of one’s word” (p. 617).

This framework can shape the production of texts by highlighting responsibility for what such texts make possible. In this way, technical communication scholarship helps us attend to texts differently in the content they aim to evoke, the processes by which they are created, and what knowledge and outcomes they make possible. Writing is always more than simply recording information (Haas, 2007; Miller, 1979; Paré, 2002/2018). Writing contributes to a larger ecology or network of texts that play an important role in enabling particular types of action or methodologies. As technical communication scholars working in transdisciplinary contexts where these themes are prevalent, we have a responsibility to use our rhetorical knowledge to encourage research design commitments that attend to embodiment in its fullest sense.

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Book Review

Beyond the Makerspace: Making and Relational Rhetorics

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Beyond the Makerspace: Making and Relational Rhetorics (2021) provides an engaging study of contributions makerspaces provide (both within and outside the making movement) to meaning making through the lens of rhetoric and storytelling. Shivers-McNair situates herself as both a storyteller and an amateur maker in the makerspace she studies and considers applications from these stories for instruction and making knowledge. Situating rhetoric within makerspaces allows Shivers-McNair to create a broad understanding of the relational rhetorics that are “both more than symbolic and more than human” (p. 11). Questioning and evaluating the boundaries between individuals within these spaces allows Shivers-McNair to evaluate conceptualizing meaning making beyond the making movement, an important trend towards reconceptualizing making as an embodied and relational practice that extends to different contexts in society (Gollihue, 2019). Through six chapters, Shivers-McNair provides a concise look into how meaning can be embodied by the individuals of the SoDo Makerspace and how considerations towards making as a relational rhetorical act can extend beyond the scope of one specific makerspace. Readers are invited to consider making as a boundary-marking practice that can speak to the larger nature of how we understand meaning beyond words.

Shivers-McNair’s ethnographic work of the SoDo Makerspace during and after its closure and the resulting interviews with makers illustrates how making and meaning shift when understanding how making is created. In Chapter 1, Shivers-McNair provides a framework for rhetoric as making, bringing in concepts of critical making (Ratto, 2011) and boundary markings (Barad, 2007) to situate her study from non-Western-based understandings. Shivers-McNair ties her background in rhetoric to argue for a relational rhetoric framework—one that allows her to consider this work as “both a process and product” (p. 23). Doing so enables her to speak to participants’ stories that address the different contexts of makerspaces, classrooms, and the communities they reside in (p. 26). This awareness allows Shivers-McNair to challenge her own initial notions of making and the making movement and evaluate whether a shift in this perspective is necessary.

Chapters 2 and 3 provide insights into the experiences of individuals within the SoDo Makerspace and an exposition of the various tools within the makerspace. Shivers-McNair establishes a basic understanding of these tools by providing technology knowledge and functional descriptions for 3D printers, laser cutters, textile machines, electronics, CNC machines, tools and computers, etc. in the SoHo Makerspace (p. 30). Makerspace technical jargon can be difficult to grasp, and notable are discussions of tools that make a makerspace inclusive (Melo, 2020), but Shivers-McNair does an exemplary job explaining the purposes of each tool when discussing how G codes as a language are a versatile file for 3D printers, CNC, and laser machines to create 3D objects in a XYZ plane. Explanations inform readers of the making process individuals experience, enhancing discussion of makers’ complex identities and the stories they hold, or, as Shivers-McNair states, the spatial manipulations that occur when these individuals situate themselves in these contexts. Focusing on specific narratives around making items, notably one story about a spatial manipulation of a 3D printed toy, Shivers-McNair thoroughly considers how an object represents the acts of creating and how a space shapes identities of the volunteers and the patrons within the physical space. Bringing in these narratives of different makers within the makerspace in a concise manner allows Shivers-McNair to create an understanding of how individuals relate to one another. As a reflective metaphor, the spatial manipulation 3D printed toy also allows Shivers-McNair to further discuss the boundary making practices she and others have experienced within the SoDo Makerspace.
Working through this spatial manipulation in Chapter 4, Shivers-McNair discusses disequilibrium, defined as a means to understand the “imbalances and disruptions in a makerspace-as-system” (p. 66). Disequilibrium enhances making’s learn-by-doing ethos with mistakes and failings. Pushing the notion of what is working versus what is not, Shivers-McNair considers how the SoDo Makerspace balances understanding that everyone is an amateur and that differences exist in what works depending on who is in the space. The individuals within that space, in turn, influence what is made or not made. For example, Shivers-McNair notes how one individual’s desire to create more safety protocols was deemed less crucial than other initiatives, leading to that individual (who happened to be a woman) leaving the space. This woman and others leaving the space led to a gender imbalance within the makerspace, an unfortunate issue that all makerspaces struggle with, which only furthered the types of items that could possibly be made. Shivers-McNair further examines imbalance through narratives from two students with diverse abilities physically moving through the makerspace: one relies on a stationary configuration due to their visual impairment and the other appreciates the mobility of the space to accommodate their wheelchair (p. 84). These examples speak to how privilege affects how individuals experience disequilibrium in makerspaces, as each individual will not have the same ability to make as other individuals if their needs are not being met. Though this chapter explores many facets of disequilibrium, it is rather brief in touching on various imbalances in the space, leaving room for where points could be explored in more detail, such as constraints of capitalism guiding the closure of the SoDo Makerspace and makerspace items that went on to be mass produced. This chapter ambitiously addresses many aspects of disequilibrium that equally hold importance when considering imbalances in making.

Chapters 5 and 6 focus on making after the closure of the SoDo Makerspace, as well as discussing inclusivity and diversity as Shivers-McNair engages with the making community. Through conversations with a former SoDo Makerspace volunteer, Shivers-McNair redefines issues of inclusivity and diversity through localizing action rather than risk tokenizing the identities of those in making (p. 98). In doing so, Shivers-McNair is able to extensively examine and provide advice on making from the perspectives of her subjects (p. 104–106) as a way to illustrate relational understandings that can be applied to instructors and researchers. Shivers-McNair’s own identity is used in the final chapter to examine how her understanding of making meaning has shifted to consider how makerology impacts how writing can be taught and assessed. Her conclusion reinforces the need for continuing work of understanding making through the lens of narratives, especially related to narratives that emerge from longitudinal ethnographic scholarship of spaces like the SoDo Makerspace.

Beyond the Makerspace provides a framework for understanding how makerspaces are shaped and defined to create relational rhetorical meanings, while also setting a basis for how the nature of such understandings can continue to evolve beyond the scope of the makerspace’s walls. Shivers-McNair points to how additional studies of different types and functions of makerspaces (such as university versus for-profit/public-benefit makerspaces) shed further light on the future of making and rhetoric over the course of the maker movement and beyond. This contextualizing of interdisciplinary and boundary marking aspects of making meaning establishes Beyond the Makerspace as an informative resource for educators, makers, researchers, librarians, and institutions to consider the ways in which we make and to further question why we make meaning.

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Book Review

Vibrant Matter: A Political Ecology of Things

Jane Bennett


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In Vibrant Matter: A Political Ecology of Things (2010), Jane Bennett encourages her readers to slow down the internal thoughts of human superiority over “intrinsically inanimate matter” — thoughts that prevent them from “detecting…a fuller range of the nonhuman powers circulating around and within human bodies” and their political systems (p. ix). Some readers of CDQ may wonder why a book from 2010 is worth our attention in 2022. The COVID-19 pandemic, the U.S. Supreme Court’s ruling on women’s reproductive autonomy, and the restrictions placed on the EPA’s control over carbon emissions all suggest a clear resurgence of what Bennett calls the oft-repeated “vitalism-materialism debate” (p. 90)—the debate over how far affect, agency, animacy, and vitality extend. Bennett resolves the tensions of that debate by fusing traditional ideas of mechanistic materialism with the notions of an unknowable agency in all matter (not just humans), an agency that lacks representation in current political thought. If technical communicators and designers dedicated to crisis/risk communication as well as those studying and producing political technologies (Cheek, 2021, 2022) didn’t see the application of Bennett’s “vital materialism” at the end of the Bush era’s heated debates over stem cell research and the war in Iraq as well as the North American power blackout of 2003, then perhaps, given the current political climate, I can persuade them to find merit in revisiting Bennett’s arguments.

Bennett’s work steps beyond traditional materialism as it attempts to reprioritize rather than break down the dichotomies of and differences between the human/nonhuman as well as the organic/inorganic. By that I mean Bennett does not claim that differences don’t exist, but that they are less significant than formerly perceived. According to Bennett, all things have vitality or affective agential capacity that influences the world in significant ways, as evidenced in her depiction of the carbon-dioxide and methane gases produced by the masses of trash in landfills, a result of Americans’ hyperconsumption (p. 6). To that end, one of her objectives is to help members of the public and policy makers “sketch a style of political analysis that can better account for the contributions of nonhuman actants” (p. x). What distinguishes her from mechanistic materialists is her adherence to a selection of poststructural canon, claiming that the vitality of matter may be empirically unknowable yet still material; what distinguishes her from vitalists (especially culture of life advocates whom she calls latter-day vitalists) is her claim that that vitality is not divine but produced by the mere presence and assemblage of material.

Within assemblages—the coalescence of materials—the agency or “affect” of things becomes not necessarily more potent (as the most seemingly innocuous nonhuman material can have potent affect), but more complex. Humans, for example, are a rather complex assemblage of things. However, Bennett is sure to temper that claim by insisting that the complexity of human assemblages does not place humans at the apex of some hierarchy of vitality. What she indicates, rather, is that all matter has “efficacy, trajectory, and causality” making it agential, even if the trajectory is “absent or obscure” (p. 32).

Questioning the sphere of influence that nonhuman agental assemblages encompass within political ecosystems has never been more important to technical communicators and technology designers who are currently responding to the COVID-19 pandemic. Viruses seem to occupy the space between the living and the dead, and yet their vitality is obvious. Despite its dependence on biological hosts, the coronavirus disease seems to possess the will to persist and spread with a stream of political causes and effects in its wake. Like Bennett’s interpretation of Darwin’s worms (p. 98), the virus produces effect without an intentional
or apparent trajectory. If there is anything to be learned from the COVID-19 pandemic, it is that something microscopic, like a non-living virus, has agential capacity to exert force on a biological specimen. What’s more, when a virus forms an assemblage with a myriad of hosts and materials, the vitality of the assemblage produces even more political effects, limiting humanity’s ability to cast blame on one sole actant. In that sense, Bennett suggests that the “public” recognize that a “politics devoted too exclusively to moral condemnation [of one actant] and not enough to a cultivated discernment of the web of agentic capacities can do little good” (p. 38). Although Bennett does not downplay the role of individual accountability, she advocates a politics that recognizes “agency as distributive” (p. 38) among material actants, the recognition of which can lead to more appropriate political action that decents humans and emphasizes vitality of all materials.

One of the greatest critiques of vital materialism, to which Bennett responds, is that a “horizontal structure” in which humans are simultaneously human and an assemblage of matter opens the door to subjection or objectification of other humans (p. 98). Today’s pro-life advocates might argue that such a restructuring justifies the exploitation of the unborn fetus. Bennett, however, addresses this concern not by “denying humanity’s awesome, awful powers” to the point of objectification (p. 10) but rather by raising “the status of the materiality of which we are composed” to that of actant (p. 12). Under Bennett’s positive, as opposed to critical, ontological construction, technical communication and technologies that attempt to raise vibrant matters out of subjection, simultaneously raise out of subjection those persons who do not fit the mainstream “models of personhood” and are, according to “Kantian morality,” equated with nonhumaness (p. 13).

A U.S. Supreme Court ruling on abortion would look very different if it considered the way Western philosophy links the nonhuman with marginalized individuals. Among those non-conforming individuals would be the woman carrying the unborn and unwanted fetus, which, according to Bennett’s theory, is not just an organism in isolation, but a material that is part of the assemblage that makes up the woman inside and out. In essence, a ruling under that consideration would “detach ethics from [Kantian] moralism and…produce…action appropriate to a world of vital, crosscutting forces” (p. 38) and contextualities.

Other concerns that Bennett forces technical communicators to view contextually are those concerns that the vital materialist has in common with the environmentalist. In short, environmentalism’s insistence on a division between nature and culture reinforces the human’s superior role as caretaker, once again “highlighting the agency of humans” (p. 115). According to Bennett, “If environmentalists are selves who live on earth, vital materialists are selves who live as earth, who are more alert to the capacities and limitations” (p. 110). Bennett is not, however, so naive as to suggest that viewing ourselves (with our accompanying politics and technologies) as, in the words of Deleuze, “ontologically one, formally diverse” (p. xi) will somehow produce an altruistic tenderness for the vital materials that sustain or threaten our existence. However, “it can inspire a greater sense of the extent to which all bodies are…inextricably enmeshed in a dense network of relations” (p. 13), meaning that harm to one part of the network will ultimately harm the self. Ironically, the more we picture ourselves less as humans and more as a material woven into the fabric of existence, the more we serve human interest. Some might suggest that the hubristic self-interest endemic to the human condition has already caused enough environmental harm; we do not need anymore. However, what Bennett’s vital materialism suggests is that we don’t have enough. She advocates for a more expansive and longer-term self-interest. West Virginia’s legal action against the EPA as well as the U.S. Supreme Court’s final ruling to restrict the EPA’s control over carbon emissions and toxic pollutants produced by the energy industry is one example of how a shallow self-interest, one that views human interest as a divine mandate, can produce greater long-term harm. A deeper self-interest would recognize that an enduring prosperity depends on human and nonhuman materialities coalescing in ways that disrupt the status quo of instant gratification.

Because Bennett’s objectives are both philosophical and political, she offers two suggestions for fostering a discernment that will temper ontological anthropocentrism. Paradoxically, her first suggestion, one that is easy for technical communicators to adopt, is to anthropomorphize to the point at which vitality, once attributed uniquely to humans, “is no longer above or outside a nonhuman ‘environment’” (p. 120). The second is to avoid engaging in the philosophical attempt to define humanness. Unfortunately, the two suggestions appear at best to be rhetorical, relying on the assumption that 1) her suggestions will produce the desired ontological shift, and 2) that the ontological shift will produce the desired ethical behavior. Bennett, through her actionable approach, successfully strays from critical theory’s popular method of “demystification” (p. xiv), a method that leaves ethics out to dry. The elusive question that remains is the exact nature of the relationship between the ontology of vital materialism and ethical action motivated by a deeper self-interest.

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Wesley Mathis is a graduate student of technical communication and rhetoric at Utah State University. His research interests include the rhetoric of crisis communication, knowledge legitimation, and ethics, especially as they pertain to environmental policy and scientific ethos.
In *Dislike-Minded*, Jonathan Gray makes a fascinating case for why the idea of dislike, away from disgust, anger, or hatred is worthy of its own lane of study. Pointing out that ratings, algorithms, collection data, and even academia prioritizes positive attributes like *likes*, Gray suggests that we in fact do a disservice to our understanding of choice (what it is, who it’s for, and why) by excluding ideas that represent dislike. As an extension of taste, he points out that our connection of dislike to negative opinions like hate or aversion are misdirected as a group opinion instead of an individual idea. Further, the book suggests that this view reduces dislike’s complex emotional engagement—comprised of a number of factors that include things like disappointment or expectation, the inescapable nature of the work, or the critical reception of a text or its handling of specific ideas—down to a simplistic dismissal or nonchalance. Instead, Gray posits that dislike works as a focused narrow consideration that often requires a deep connection to either the subject, or the subject field. However, it is often thought of based off a grouping of generalized characteristics akin to assumptions or stereotypes, as opposed to its actual singular positionality, where dislike straddles the complicated line between scrutiny and dissatisfaction.

In the first part of the book, when looking at dislike based off texts, Gray writes that this often requires a level of textual analysis that is too small for media-based work. Presenting this in his astute example of the inescapability of genre, he points at the ubiquitous movie industry’s weekly marketing claims, which often present particular movies as the #1 movie in the world, or the news media when Fox News lauds itself as the most-watched cable network, thereby making his case. While the billion-dollar *Avengers: Endgame* box office haul and/or a 2.5 million weekly tv news audience is a notable feat, the realization of *who didn’t view either* property, with 98% of the world’s population unaccounted for, remains Gray’s strong counterpoint. Some people would actively choose to disregard watching either franchise of course, but Gray’s argument for the study of dislike accounts for the question as to why the idea of paratext—or the materials surrounding a particular text (Genette, 1997) —doesn’t grab more viewers. Here, the idea of dislike sits as a manifestation of negotiation (Ahmed, 2010), distorting the image what a “good” text is to each viewer, and he argues that the balance between what one finds pleasing versus dissatisfaction.

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When granted by the exclusion of an expectation, Gray says dislike is to be expected but is rarely considered. Throughout a series of interviews conducted on the subject, he points out a variety of instances that the interviewees give ranging from: media bias, overt violence and sexuality, or the insincerity of corporate public relations. However, in all of them, the expectation of a different kind of show over what appeared, remained constant. Even or especially when sequels or adaptations are approached, Gray’s
idea is intensified as he brings up the abject disappointment that occurs because of a number of specific moments within particular shows. Whether thinking through the suggested unconscious racism of Tina Fey and Netflix’s *Unbreakable Kimmy Schmidt*, or the repeatedly graphic sexual violence of *Game of Thrones* (even when it is forewarned and/or predicted within G.R.R. Martin’s text), Gray pinpoints that often dislike comes with distinct concrete reasons that are still overlooked. The most egregious example of this idea in the book, comes at the expense of Peter Jackson’s *Hobbit* trilogy, as the follow up to the much-beloved *Lord of the Rings* cinema feast. After a lengthy process, as Gray explains how overzealous film reviews reimagined the original trilogy in a cinema landscape of endless reboots and uninspiring action popcorn flicks, imaginatively, they cast Peter Jackson as Bilbo the plucky little Hobbit that could, Sir Ian McKellan as a living wizard, and even the country of New Zealand as a fantastical shire of lore, before pointing out the shift of dislike that manifested as a direct result of deeply specific displeasure given to its sequel. The *Hobbit* trilogy, paraphrased from the litany of reviews Gray depicts, was and is seen as the worst insult to a fantasy constructed legacy, crafted as a masterclass in “capitalist excess, lifelessly coated in CGI plastic” (Gray, 2021).

Yet for all of the conversation about fandoms and the toxicity they can possess that is scattered through *Dislike-Minded*, Gray’s discussion on race as a particular dislike around performance was one of the most interesting, if under-discussed aspects of the book. Pointing out his participants various dislikes and differences with film and tv shows of color, his response to dislike centers around important distinctions of internalized othering, misogynoir, and respectability politics that seem to collectively appear whenever people of color consume mediated texts. He points out that certain types of dislike are almost required to be performed to be understood, and links this to the discussion around race and identity that his study considers, as an interesting aside that should have had a central tenet in the text’s theme (even as it is discussed numerous times throughout).

For teachers and researchers (even considering fields like marketing, public relations, or public speaking), Gray’s text is a thoughtful construction that forces the reader to reconsider their approach to negativity in general. His arguments are compelling and well considered, as he attempts the difficult task of appealing to reason against ideas that most would simply disregard. He asks the reader to do the work of connecting contextual ideas to any critical response, and while it is not always the easiest task, his answer suggests that the result is usually well worth the effort. In Gray’s construction, by forcing the specificity of context, such views often reveal who the reader is and what their values are, while simultaneously revealing biases and/or gaps in their knowledge situated through experience. Such work can change the nature of communication. It may also create narrowly biased channels of interest, catering to the ever-changing aesthetic of societal taste. But I believe the capacity for Gray’s theory to do more good than harm makes it an apt and considerate addition to literature and communication strategy. I also appreciate the plea he makes towards the book’s end however, professing that through strongly worded opinions of note, we may be able to better understand the politically connected underlying issues that guide those beliefs. In *Dislike-Minded*, he makes a deeply compelling argument to stare directly into the face of an idea that we find distasteful and inappropriate, but in the name of bettering ourselves, through an entertaining, yet thoroughly complex piece of research that is indeed worthy of its name.

**REFERENCES**


**ABOUT THE AUTHOR**

D’Arcee Charington Neal is an award-winning professional storyteller, and fourth year doctoral candidate at The Ohio State University in English and Disability Studies, focusing on the intersections of black digital media and disability erasure within Afrofuturism. Focusing on stories of the Afrophantasmic, or black disabled people who exist as phantoms within the community as both a power and a problem, D’Arcee is a recipient of the 2017 Tony Coelho NBC/Universal Digital Media Scholarship and winner of Best English Graduate Research at Ohio State University for 2020. However, when not theorizing about black techno-agency, he believes that the future can and should be both accessible, and in Wakanda, forever.