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ABSTRACT
This paper introduces the concept of transactional design—integrating Druschke’s “transactional” model of rhetoric and science and Kinsella’s model of “public expertise”—to demonstrate how technical communication and user experience (UX) designers and researchers can play an essential role in helping scientists cultivate meaningful relationships with members of the public toward the goal of making scientific content more accessible and actionable. This paper reports on the challenges that arose when a water modeling system built for experts was adapted for a public museum audience. It discusses specific issues the UX team had in contending with outdated “deficit” and “conduit” models of communication when working with scientists to adapt the system; it provides a checklist for steps that technical communication and UX designers and researchers—as those who best understand audiences and work directly with users—can champion the idea of transactional design to setup knowledge-making partnerships toward the co-construction of public-facing scientific communication projects.

INTRODUCTION: A STORY OF DROUGHT IN THE SOUTHWEST
The Desert Southwestern US is in the middle of a 20-year drought that has led policymakers to reassess the amount of water allocated from the Colorado River to various states in the region. On May 20, 2019, leaders from the Colorado River Basin (CRB) states, the Navajo Nation, and Mexico, all signed the historic Drought Contingency Plan (DCP) that would help mitigate, for the short term, the effects of drought that have depleted the water levels of the Colorado River and associated reservoirs to between 35–41% of their capacity. The Colorado River supplies 15 million acre-feet per year of water to the region, so ensuring an adequate and consistent supply to these states is critical to maintaining economic stability. Adding to this burden on the water supply of CRB-reliant states have been increases in population, development, and uncertainty about future drought. The passage of the Drought Contingency Plan demonstrates an understanding of the sacrifices that need to be made across all sectors to work together to develop water management solutions over the long term. Reclamation Commissioner Brenda Burman lauded the effort after the signing by saying, “These agreements represent tremendous collaboration, coordination and compromise from each basin state, American Indian tribes, and even the nation of Mexico” (Bureau of Reclamation, 2019).

Up to this point, our water managers and policy makers have done much of the difficult coordination in making sure our communities have enough water. However, as drought continues and we “max out” the ways in which technology can help us use water more efficiently (e.g., low-flow toilets and showerheads; high-efficiency agricultural irrigation systems), people will be called upon to express their opinions about the kinds of choices they are willing to make, as a community, to manage a diminished supply. Helping community members better understand their water systems—where their water comes from and who the stakeholders are who rely on a consistent supply—is thus essential to equipping individuals with the knowledge they need to contribute to the health and well-being of their communities. Equally essential, however, is understanding what people’s lived experiences with water have been, what they

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Manuscript received October 31, 2019; revised May 12, 2020; accepted June 25, 2020. Date of publication August 6, 2020.

CDQ 10.1145/3410430.3410431
value, and what they feel they need to know to help them make meaningful choices.

This paper reports on the challenges that arose when a water modeling system built for experts was adapted for a public museum audience. It introduces the concept of transactional design—integrating Druschke’s “transactional” model of rhetoric and science and Kinsella’s model of “public expertise”—to demonstrate how technical communication and user experience (UX) designers and researchers can play an essential role in helping scientists cultivate meaningful relationships with members of the public toward the goal of making scientific content more accessible and actionable. It provides a checklist for steps that technical communication and UX designers and researchers—as those who best understand audiences and work directly with users—can use to setup knowledge-making partnerships between scientists' knowledge and users’ expertise toward the co-construction of public-facing scientific communication projects.

THE WATER MODELING SYSTEM CALLED DROUGHTSIM

DroughtSim® is an interactive mathematical computer simulation model developed by scientists at a water policy center in the Desert Southwest to help experts and policy-makers study the effects of factors such as population, temperature, precipitation, and agricultural production on the region’s water supply over the next fifty years (see Figure 1).

Figure 1: Flowchart of the DroughtSim model.

The way experts interact with DroughtSim is via an interface that is projected across several large screens in a room called a “Decision Theater.” These large screens can accommodate the available inputs and outputs for experts to analyze in graphical form after running the model (See Figures 2 and 3).

Several years ago, a National Museum2 approached the water policy center about adapting the DroughtSim for public museum audiences who live in the communities that would be hosting a traveling center about adapting the DroughtSim for public museum audiences. It introduces the concept of transactional design—integrating Druschke’s “transactional” model of rhetoric and science and Kinsella’s model of “public expertise”—to demonstrate how technical communication and user experience (UX) designers and researchers can play an essential role in helping scientists cultivate meaningful relationships with members of the public toward the goal of making scientific content more accessible and actionable. It provides a checklist for steps that technical communication and UX designers and researchers—as those who best understand audiences and work directly with users—can use to setup knowledge-making partnerships between scientists' knowledge and users’ expertise toward the co-construction of public-facing scientific communication projects.

This particular National Museum traveling installation is themed around people’s relationships with water, and the National Museum wanted to provide an adapted simulation experience for the public to learn how their water supply and demand system works, who the major water users are, where supplies come from, and how water affects their local economy and environment. The National Museum was scheduled to travel to rural towns all over the country, visiting a new town every two months or so.

The museum version of the DroughtSim, called “DroughtSim America” (DSA), that scientists at the center developed challenges museum visitors to successfully manage their region’s water supply-and-demand in a time of drought. It uses a complex array of regional and state-specific water data from the area where the museum is currently visiting. In addition to asking users to make choices about how much water to take from various sources to meet demand (e.g., groundwater, surface water, reclaimed water), it asks them to enforce various levels of efficient water use among community stakeholders (e.g., townpeople, industry, and farmers). Scientists hoped that visitors at the exhibit would learn “That [users] have a seat at the table and everyone needs to be acknowledged and recognized. That [water supply and demand] is a complex system with multiple benefits and multiple perspectives” (personal communication, February 15, 2019).

The goals the scientists articulated were noble; however, the scientists had built the DroughtSim America (DSA) interface based on the expert interface and did so without input from any members of the rural audience who would be interacting with the DSA in the museum environment. As the simulation was developed without regard to the particular needs of its target audience and, as I will show, followed common deficit and conduit models of development, the simulation did not meet the goals the scientists had in mind nor did it connect with the needs of users. Ultimately, the complexity of the system scientists were trying to communicate did not connect with the complexity of the lived experiences of the rural audience tasked with using the system, leaving participants confused and uninformed.

When visitors to museum exhibits, parks, and other tourist sites feel incompetent or confused in the face of problems they are being asked to solve, they are demonstrating what Gianni Moscardo calls “mindlessness.” Moscardo adapted Ellen Langer’s research on mindfulness to show the ways in which museum installations, national park sites, and other tourist experiences can be improved to encourage more mindful, engaged, and satisfied visitors. In contrast to mindlessness, mindfulness occurs when a visitor

Actively processes new information, creates new categories for information, and thinks about new ways to behave. Mindfulness is associated with more learning, better decision making, increased self-esteem, and feelings of control and enjoyment. (Moscardo, 1999, p. 25)

Mindfulness is imperative to visitors’ being able to interact meaningfully with sustainable, ecological, and conservation-based science knowledge. As this paper will discuss, transactional design is essential to ensuring mindful experiences because it requires that scientists value the knowledge and experience of the people whom they are trying to reach (what I refer to as “user expertise”) as equal to their own. But to better understand that process, and how much of a challenge adopting a transactional design approach to science communication may pose, we must first examine a few
flawed yet pervasive science communication models that privilege technical rationality and scientific expertise at the expense of the user’s expertise.

**TECHNICAL RATIONALITY AND MODELS OF DEVELOPMENT**

Communicating science to non-scientific audiences has historically embodied a sage on the stage relationship between scientists and the public. Walsh (2013) shows how scientists throughout history have adopted a prophetic ethos when trying to convince the public of the validity of scientific information. Scientists have also historically communicated their findings by relying on logical appeals supported by scientific data (Briselli, 2013). These appeals are still common, despite the fact that “public understanding and attitudes do not develop solely in response to objective reasoning” (p. 3). Kinsella (2004) citing Fisher, Pearce and Littlejohn; and Toumey, suggests that scientists default to using logical appeals because people’s perspectives about complex scientific issues are diverse and often deeply entrenched, leading them to “converge on technical rationality as the only widely accepted form of argument.”

Yet, as technical communicators are often acutely aware, communication based on assumed technical competency silences expressions of individual and community values and “constitutes a formidable practical and symbolic barrier to increased citizen participation” (p. 83).

The long-debunked, but persistently employed “deficit” model of science communication is one such model that privileges technical rationality. This model describes a top-down communication structure where scientific information flows from the scientist to the uninformed but receptive community member. This model assumes that if scientists could just distribute their knowledge more widely—could just get their knowledge out there—a receptive audience of community members would happily learn from and act upon it. However, this model ignores myriad factors that influence a person’s relationship with scientific knowledge and the ways they use that knowledge to inform their opinions and actions. In a recent report by the National Academies of Science, Engineering, and Medicine, the authors address why this model is ineffective:

The deficit model assumes that if a message about scientific information is well crafted for one audience, it should meet the needs of other audiences as well. In fact, effective science communication is affected by the context and requires engagement with different audiences in different places at different times, taking account of what they want to know and already know, understand, and believe. (NASEM—my emphasis)

The NASEM is the latest in a long line of voices who have challenged scientists’ reliance on a deficit model (Irwin 2014, 1995). Yet it persists, I argue, because there haven’t been compelling enough consequences for scientists to act differently. Funding agencies, if requiring public facing communications at
all, are not yet requiring that scientists find ways to empirically prove that they are “taking account of what [users] want to know and already know, understand, and believe” in the communications they develop for the public.

Caroline Gottschalk Druschke and Bridie McGreavy (2014) describe this kind of contextual (rather than deficit) model as one that “involves interaction and two-way communication, emphasizing the importance of building trust and offering scientific information relevant to particular public audiences” (p. 47). Better understanding audiences and their responsiveness to scientific information is a topic of study that scholars in cognitive science and psychology have shown interest in. For instance, researchers in the cultural cognition program at Yale University study the ways in which people are receptive—or not—to information that may challenge their existing knowledge or values. These researchers have developed a grid of classifications to help explain people’s habits in resisting or accepting new scientific information (Kahan, 2010).

Similarly, scholars of rhetoric have become valued for their understanding of persuasive rhetorical appeals, especially the importance of the role that credibility (ethos) and appeals to emotion (pathos) have in complimenting more common appeals to logic (Vernon, 2014). However, even if scientists are made aware of what scholars from other disciplines can help them understand about users, it may not prevent them from engaging what Goodwin (2014) calls a “conduit” model of communication, where scientists look to other disciplines, such as rhetoric, for techniques to “wrap around the science content they will provide” (p. 3).

Rather than simply enhancing the communication of scientific knowledge; however, Spoel et al. (2008) suggests that rhetoric can be used to engage audiences in caring about what is being explained. In other words, it is a question of engaging the whole person through complex and rich rhetorical means, weaving together ethical, logical, and emotional proofs. It is a question of telling stories...that connect the science to people’s everyday knowledge, lives, values, and concerns (p. 53)

Appealing to the “whole person” in any communication context includes being willing to empathize with people’s concerns, knowledge, and values. Rodriguez and Davis (2015) suggest that science communicators need to begin by asking, “Who are we talking to?” and in doing so, take the extra steps to develop an understanding of different audiences’ values, life experiences, cultures, disciplines, and communities, what can collectively be thought of as their “expertise.”

This approach should feel familiar to technical communication and UX specialists, who are trained in a range of research methods that they employ to get to know users’ expertise. But connecting UX specialists with scientists can be challenging if scientists aren’t aware that they need to connect at all. Druschke (2014) discusses the importance of this interdisciplinary collaboration as one that positions

Scientists and rhetoricians of science as co-constructors of engaged science that gets things done in the world... This shift calls us to turn the focus away from exchange (what science gains from rhetoric and vice versa) and towards conceiving of our work as a necessary and integral part of the engaged practice of science itself” (p. 2).

Druschke is trying to raise the importance of the work that rhetoricians bring to science by integrating them into a single shared process that transcends each separate area of study. Druschke seeks to move beyond what she calls a “transactional” relationship between rhetoricians and scientists to a more interdisciplinary approach that will improve the practice of science itself.

**INTRODUCING TRANSACTIONAL DESIGN**

However, when developing science communication experiences for the public, I would like to advocate that we refocus our attention on just such a transactional relationship, which does not turn away from, but instead actively embraces, the idea of “exchange.” A transactional model thus acknowledges the obvious divides that exist between the knowledge that both scientists and the public bring to any communication situation, but rather than positioning one as in deficit to the other, it registers the knowledge of each as equal.

A transactional design model champions what Kinsella (2005) calls “public expertise.” Kinsella cites Fisher and Forester’s work advocating for a dialogue in which “the local knowledge of ordinary citizens and the abstract knowledge of technical experts interact synergistically to provide more complete analyses and more effective decisions” (p. 89). For synergistic interaction to occur; however, scientists need to be as open to learning from and valuing the experiences of the public as scientists expect the public to be open to learning from the data scientists have to share. Transactional design proceeds through an iterative process that doesn’t treat audience needs as secondary to science. It emphasizes, rather, that science communication only works when researchers study audience expertise—including finding out what members of the audience want to know, already know, understand, and believe—and acknowledge that audiences have knowledge of equal value as the scientific knowledge that scientists are trying to communicate. Technical communication and UX specialists can play an essential role in helping this occur.

To illustrate the need for such a model, I will first trace the evolution of the DroughtSim America development process, which will illuminate what technical communication and UX specialists need to be aware of when working with scientists who are already invested in the scientific validity of a complex system. Scientists, understandably, value their own knowledge and habits of mind, so I will also address the ways UX specialists can work with scientists who may value the accuracy of data and complexity of relationships among data above all else, including audience engagement. I will also discuss how UX specialists can mitigate unsuccessful models of science communication toward a transactional design model that will allow specialists to intervene in the early stages of a project to ensure positive outcomes and mindful interactions. This paper will conclude by identifying features of a transactional design model and discuss why it is so important for UX specialists to champion this model with scientists if they hope to engage users in mindful ways.

**DESIGNING AND TESTING THE DROUGHTSIM**
By April 2016, the scientists had finished building their initial version of the DroughtSim America, adapted to fit on an iPad that could easily travel to the rural towns around the country where the museum would be hosted. It was not until after this initial build (and not long before the simulation was set for release to the first few towns), that the UX team was asked to consult on clarity and design issues with the user interface. It should be said that this initial consultation was only requested because the leads of both the UX team and scientists’ research center had recently been introduced to each other through a leadership organization at their university. It is only because of this introduction that the scientists even became aware that technical communication and UX research and design were an area of expertise. This is a challenge that I will discuss more later.

After the UX team conducted an initial audit of the interface and flagged basic image, color, and language issues, we discovered that the interface had not been show to any users in the target audience. We were granted IRB approval to research users engaging with the system in a range of environments. A graduate student team member of ours was living in the southeastern United States at the time, close to where the museum would soon be visiting, so we sent an iPad with her to the region and conducted usability tests in two rural towns there. She brought the iPad to a local hardware store in one town and to a library in the other town. She recruited fifteen community members to interact with the simulation using a think-aloud protocol and asked them structured interview questions about their experience afterward. Based on that testing, we submitted a host of recommendations for improvements to the interface design, instructions, and task flow. We also developed personas of rural users for whom the scientists should design as we worked with them to make revisions to the system.

Testing the system with rural users laid bare how different their relationships with water were compared to those of the urban professionals who had been the only audience members to have interacted with the expert system up to that point. For instance, whereas urban dwellers rely a great deal on urban infrastructure to deliver water to their taps and grocery stores, every rural user we spoke to had a ready answer to “What would you do if you ran out of water?” Responses to this question included, “I would dig a well,” “I would use water I already collect in water tanks,” “I would get water from the three rivers,” and “I would filter water from the irrigation reservoir.” Our rural participants did not seem particularly surprised at the possibility that their government may not be able to ensure it would be able to provide a consistent water supply during a time of drought.

These responses show inventiveness, resilience, and fortitude. Unfortunately, these insights were put aside as the UX team and scientists’ research center had recently been introduced to each other through a leadership organization at their university. It is only because of this introduction that the scientists even became aware that technical communication and UX research and design were an area of expertise. This is a challenge that I will discuss more later.

Throughout this period, the UX team felt that it was doing genuinely useful work: in response to user feedback, we developed a new layout, color scheme, and font scheme, as well as new graphics and text that would be added to the interface to explain the results of a user’s choices in more active, concrete terms (See Figure 4). We also developed a narrative game-like scenario that would set up a user’s interaction with the simulation. We recorded a screen-cast video that presented the narrative scenario and the instructions on how to use the simulation. The game scenario we devised positioned the user as traveling back from the future, where drought had ruined the community, to help the citizens of today use the DroughtSim to enact the best measures to avoid future drought. We felt that contextualizing the water management responsibilities of the simulation in more urgent, problem-solving terms would impart a sense of heroic responsibility on the user and provide a more exciting challenge.

However, our efforts proved to be misplaced. In October 2018, the National Museum was stationed at a site within two hours of our university, so we visited the site and observed users there for four hours. Overall, users did not choose to approach or engage with the DroughtSim (the iPad screen appeared too small to be noticed among the other colorful exhibits), and those who did showed difficulty understanding the instructions for how to use the system. We witnessed technical errors in which built-in timers were not giving users enough time to complete the simulation before kicking them off of it. We also observed that other sounds accompanying other exhibits in the museum made hearing the game scenario and instructions difficult. This was hugely consequential and made us realize that gamifying science content is not always more effective than more traditional approaches if the complexity of the gaming scenario proves more cognitively burdensome than what people are expecting to experience (Giannakos, 2013; Koenig, 2008). The enjoyment and motivation people have come to expect through a gaming experience does not always translate to positive learning outcomes (Papastergiou, 2009) and may even have the potential to significantly decrease retention and transfer when compared with more traditional methods (Adams et al., 2012). In this case, asking users to engage in a game that established a time-travel scenario was simply too complex to be conveyed using difficult-to-hear audio, even if also transcribed on the screen. We observed first-hand people growing impatient at the level of cognitive investment we were asking them to make in this casual museum environment.

In light of our findings, we replaced the game scenario and video instructions with a printed instructions board that we designed to surround the iPad. This would serve two purposes: One would be to make the area that the exhibit occupied larger and more attractive to users; the other would be to make the instructions ever-present so that users could refer back to them as they were engaging with the simulation. Throughout November 2018, we user-tested iterative versions of the instructions with 37 students from the psychology 101 course on our campus. We asked some to interact with the simulation individually, and others in pairs, and interviewed each of them following their sessions. All sessions occurred in
our program’s UX lab. We rapidly prototyped revisions to the instructions boards between days when students interacted with the simulation, adding clarifications and content where needed without overloading the display. The instructions board was sent to the next town in the traveling museum’s path and, though we were unable to travel to the town to see it, the former town’s museum manager called to say that he found the improvements more engaging and easier to interact with. Problem solved!

However, as we continued our research with users, we noticed that people were still largely confused by what the purpose of the simulation was and what they were supposed to get out of it. Because the simulation presented water as a supply-and-demand system that included all variables and results on a single screen, it remained conceptually too complex for people and they felt ill-equipped to manage water in a meaningful way on that level. This is where we began to realize that we hadn’t done a good enough job researching what people already knew about water (e.g., “how much water do you use in a day?” “Where do you think the water you use comes from?”) and what they felt would be useful to learn. Although some of our college-aged participants seemed to know very little about water, our rural and older participants were eager to share their personal expertise with water.

We found ourselves circling back to the kinds of conversations we had had with the participants we interviewed in the rural southern towns a year previous. We had asked those participants questions about their lives and their relationships with water because we were interested in developing personas. In that research, our rural southern participants showed substantial knowledge about local sources of water—as well as a resilience about their own ability to secure water—that should have alerted us to their potential disinterest in learning about water systems on an abstract level. In setting aside these insights, we had inadvertently pivoted toward a “conduit” approach to design, where we were developing rhetoric-driven design and language improvements to “wrap around” the existing scientific interface we had started with rather than interrogating how suitable the design of this kind of interface (drawing from a complex scientific model) itself would be for a rural, public audience. This conduit approach was also encouraged by the scientists themselves, who had invested years of effort into a complex system that they had neither the time nor funding to completely redesign.

So, in the spring of 2019, we continued to test the DroughtSim system, with the additional goal of figuring out what users really wanted to talk about with regard to water. Because the museum is often set up in the community centers and libraries of rural towns, we brought two iPads and instruction boards to a rural library community gathering of senior citizens. Eighteen seniors participated in our mock-museum. We interviewed the seniors about their water knowledge and water use, asked the seniors to interact with the exhibit, then interviewed them after their interaction.

Our participants’ eagerness to pivot the conversation away from discussing the system and toward their real-life experiences with water and drought reinforced just how interested users were to share what they knew and find out more about what they could do to help their communities. The DroughtSim was left behind in our conversations as confusing and irrelevant.

**CHALLENGES**

In this section, I summarize the challenges that prevented us from addressing the deficiencies of the DroughtSim system more successfully. These challenges are likely to arise working with even the most well-meaning of scientists because scientists may...
not value users’ expertise as equal to their own. The points of disconnect apparent in the challenges I discuss below illustrates the need for UX teams to adopt a transactional design approach when working with scientists on public-facing science communication projects.

**Challenge 1: Scientists undervalue users**

Technical communication and UX specialists working in commercial contexts can rely heavily on the results of well-structured user testing to prove to even the most skeptical executives that changes need to be made to a system or interface. However, unlike a commercial product that relies on satisfied customers to remain profitable, scientists typically have no incentive to make money from users, and thus less incentive to make their systems usable. Notice the contrast between what the scientist quoted below said they were hoping to achieve and how the user reacted to the experience:

> [the DroughtSim] is a tool that we can put out there in the universe; it’s user directed to help awaken citizens of simple concepts about water. We are hoping it’s a learning experience and that it comes with some new understandings about where their water comes from and how it’s being used

—Scientist’s response when asked about the purpose of the DroughtSim (personal communication, February 5, 2019)

> It was very confusing. We just faked it. We basically guessed on what we were doing.

—Community participant’s response after using the DroughtSim (personal communication, February 27, 2019)

Any commercial website that leaves users in a state of confusion will result in lost revenue and credibility. However, a user not being able to understand scientific content is more easily seen as the users’ own fault and may not be responded to with empathy.

In the case of DroughtSim, because so many academics and policy makers had interacted with the expert system, the scientists assumed that novice users to the new system would need little special accommodation, despite the fact that the system would be shown, unmoderated, on a drastically smaller screen, in a museum setting (instead of a “decision theater”), and interacted with by people who may not be particularly interested or knowledgeable about the purpose or topic. Not attending well enough to these technological and contextual differences proved problematic.

**Challenge 2: Scientists are unfamiliar with effective UX design processes**

Scientists’ undervaluing museum users of the DroughtSim began with their truncated design process. Figure 5 shows a typical UX design process, which I have modified to show the development path the scientists on the DroughtSim project took to adapt DSA. With the expert version of the DroughtSim already developed, the scientists worked with began by brainstorming communication solutions—rather than first trying understanding anything about the user who might interact with the solutions they would develop. It is unsurprising that scientists would follow this truncated process because at this point scientists have likely already developed the science that informs the public-facing version of the project. This encourages scientists to start later in the design process, rather than starting with the user.

Through this truncated process, scientists would start in the ideate phase rather than the empathize phase. If they follow the conduit model described by Goodwin, scientists wouldn’t consult a communication, design, or UX specialist until the prototype phase, when they would seek out communication techniques to “wrap around the science content they will provide” (p. 3). This approach assumes that the scientific content is objective and exists outside of any user experience or rhetorical context. In the case of the DroughtSim, the scientists already had their expert system ready to adapt, and they started at the ideate phase, brainstorming ideas about how the DroughtSim should be modified for the smaller iPad screen. They did not conduct user research in an attempt to better understand the rural visitor for whom they were designing. They also did not talk to potential museum visitors. They did not have anyone outside of the development team test the simulation at any phase.

![Figure 5: Typical UX Design Process (Briselli, 2014), modified to show an example of the scientists’ process.](image)

When the UX team was brought in, we immediately prioritized conducting user research to discover usability issues that prevented potential museum visitors from engaging with the simulation successfully. Technical communication and UX specialists consider this research essential to the success of any project. So why didn’t the scientists make sure to do such research themselves? There are several probable reasons for this. First, it takes a lot of time to conduct user research. You have to find the right users (in this case, rural citizens not living in proximity to our urban university environment), set up authentic contexts of interaction, and then be practiced enough with qualitative observation and interview methods to glean useful data from the experiences of your users. The scientists would have needed to get IRB approval to conduct this qualitative user research, including recording interviews and observations, which may be just enough of a hinderance and take just enough time out of a person’s schedule to act as a dissuading factor. The scientists would have also had to be familiar with effective UX research methods and the language to describe and design the research they would need. Our UX team, by contrast, had experience obtaining IRB permission for UX projects, which made the IRB and testing design process relatively easy by comparison.

More consequentially, the scientists were doing all of the development work on this project pro bono for the National Museum, without any funding provided beyond equipment costs. The scientists had accepted the invitation from the National Museum because they thought it would bring visibility to the research center and could be leveraged to apply for additional funding from other grants. As a result of working pro-bono, even if the user testing was
of little to no-cost to conduct, major modifications that might be recommended from the results of the user testing would be cost-prohibitive.

Finally, researching the usability of a system to meet the needs of a non-scientific user is not typically the kind of work that would result in scientific papers or advancement of scientific knowledge. The scientific knowledge for this project had been advanced when the scientists were able to incorporate more complexity through the integration of a greater number of data sources into the model. Modifying the complexity of the system into something simpler and more accessible, by contrast, would delay such advancement. For these reasons, there was little payoff in optimizing the user experience for the museum installation. Ideally, the public would learn about the tradeoffs necessary to balance a complex water supply and demand system. But ultimately, for the scientists, the project would be deemed successful if the team were able to build a glitch-free system that conveyed accurate data and would maintain the scientific credibility of the research center.

**Challenge 3: Scientists underestimate the need for UX funding**

Not recognizing the extent to which user research and testing is essential to effective user engagement means that the scientists underestimated the need to seek funding for both the design and testing of the system. Because the scientists were working pro-bono, there was no money to be had for design and testing of the translated system. However, during this time the scientists wrote a grant to a state philanthropy that awarded the center money to develop a classroom version of the WaterSim and pay teachers to attend training on how to use the system and integrate it into their curricula. Because of the scientists’ overall lack of experience with UX, however, they overlooked the opportunity to request money for the design, user testing, or improvement of the classroom system in their grant request. All of this development work seemed to be taken for granted, likely because the system already existed in one form (the expert form), so translating it to another form (the classroom form or the museum form) was assumed not to require that much technical effort. It may have also been the case that the scientists felt that including such funding requests might suggest that their system wasn’t in perfect working order, and this would have compromised their ethos on the grant. It is equally likely that the scientists simply did not know the language to use to ask for and justify design and UX funding because they had never had to request such funding in the past.

**Challenge 4: Scientists prematurely fixate on the mode of delivery**

Scientific research is often complex in nature, requiring significant background knowledge of methods, techniques, and familiarity with past research; thus, its results may only be understood by other researchers. Scientific research is typically disseminated to other scientists in the form of scholarly publications and presentations that are written at a more technical level than would be understood by lay audiences. Once findings have been disseminated in scholarly form; however, scientists may have difficulty translating their findings in a way that connects to a different audience altogether. They may engage in what design fields call premature fixation, where a scientist becomes resistant to change as their design—or in this case their findings and conclusions—take on a high level of complexity or detail. (Robertson, Walther, & Radcliff, 2007).

In the case of the DroughtSim, the scientists had spent years developing a sophisticated and complex model that had been used by technical experts and policy makers interested in exploring how changes to a number of environmental, economic, and policy variables might affect our vulnerability to drought. The model was what they had been awarded funding from the National Science Foundation to develop and it was what had gotten the attention of people at the National Museum, who asked them to develop a modified version for their traveling museum.

The model captured the complexity of regional water systems, including how water availability and demand would affect agriculture, industry, the economy, and the environment.

When adapting the model for non-technical users, the scientists wished to communicate this complexity to show users that, in drought scenarios, there will be no easy answers or simple solutions. The scientists recognized that the interface needed to be simplified from the original, providing a museum visitor with fewer variables to manipulate on the iPad versus the giant screens in the large room where technical users were able to interact with the original simulation. And yet, aside from simplifying the options a user could choose between, the scientists did not pursue major revisions to the experience flow nor did they interrogate their assumption that asking users to participate in a simulation and make regional, systems-level choices to balance their region’s water supply was the best way to connect with them about drought.

What our user testing showed, however, was that users didn’t seem to know enough about water systems to care about whether they were able to balance their regional system. Instead, users told us about their experiences with water and what they thought other people needed to know about drought. Many were aware that drought was a distinct possibility in their region. Many predicted, though with wild variety (e.g., “in a few years?” “maybe ten years?” “fifty years from now?”), that the region would experience a water crisis. But when users were asked to interact with the simulation, many weren’t interested in making system-level choices as if they were a water manager.

In our interviews, users also cited that they wanted to understand how drought would affect them and what they could do to help their communities adapt. Moscardo (1999) asserts that creating mindfulness in users requires that the exhibits they interact with connect to their personal experience and tell a good story. He establishes that there is often a disconnect between what visitors want to learn from an experience, and what the signs and other information about that experience are telling them. For instance, in one study of tourists to the Wet Tropics World Heritage rainforests in Australia, Moscado found that 50 percent of users surveyed wanted to know about conservation issues and what they could do to protect rainforests. However, only 5-16 percent of the signs delivered that kind of information. In contrast, only 36 percent of visitors expressed a desire to learn about specific plants and animals, yet 83 percent of the signs contained that kind of information (1999). Similarly, the DroughtSim did very little to connect to what users already knew, or what they wanted to get from the experience.

**Challenge 5: Scientists privilege technical accuracy and complexity**

The scientists we worked with on this project had a depth of knowledge about their subject matter that was magnetic. They provided thoughtful answers to all our questions about water and
drought, data, modeling, and how to make the best predictions possible amidst a great deal of uncertainty. But when we shifted our role from “curious questioner” to “user representative” they became a bit stubborn about making any changes to their system that would compromise fidelity to the complex picture they had painted for us. They didn’t think simplifying the complexity of the system would accurately represent the real-life situation. It also wouldn’t make people more aware of the full depth of factors that the scientists had spent so many years integrating into their model. In simplifying a non-technical users’ interaction with a complex model, a designer typically needs to sacrifice some of the complexity of what appears to determine the outcome of a system. But in addition to the scientists’ protesting that users wouldn’t experience what they needed to were the system overly-simplified, the scientists also voiced concern that were another scientist to interact with the simplified version at one of the museum sites, that person might question the intellectual credibility of the center for putting out a product that didn’t faithfully reflect all variables that determined outcomes. One scientist insisted that the system be able to withstand the scrutiny that might come from any water manager in the area who might randomly walk into the museum and interact with it. This scientist needed to make sure that his reputation as a scientist wouldn’t be compromised, no matter what that meant for the rural museum visitor user. Accuracy and complexity were more important than the user experience because accuracy and complexity were what scientists felt judged on. Becoming aware of what scientists’ value, which may be at odds with what would facilitate an engaged process for users, will better prepare UX professionals for having productive discussions with the scientists they are collaborating with.

IMPLEMENTING TRANSACTIONAL DESIGN

As these challenges reveal the extent to which scientists may believe in the supremacy of their own scientific knowledge over the experience of the user who might interact with that knowledge, technical communication and UX specialists can embrace a transactional design approach from the beginning of their involvement on projects to work with scientists more successfully. In this section I will discuss the features of a transactional design approach and share examples of how those features have been implemented effectively.

Transactional design values the localized experiences of users and connects to those experiences with the ultimate goal of cultivating mindfulness. Mindfulness is cultivated when users experience variety, multisensory media, novelty, interactivity, and when the content makes connections with where visitors are coming from, what they know, and what they value. See Figure 6 for the chart that Moscado developed to illustrate the process.

If we start with the radical notion that a user’s expertise (i.e. their knowledge gained through experience) is as valuable as scientists’ knowledge when it comes to developing effective public-facing science communication projects, what actual process can we follow to ensure mindful engagement? The following checklist can be used to help a development team of both scientists and UX specialists embrace a transactional design process:

Pre-Step 1) Proactively seek out projects in your organization or municipality by networking with scientists and looking for grants that have been funded or are in development at your organization or within your municipality. It is not likely that scientific research teams are going to prioritize the public-facing science communication components of their efforts (if there are any) early in the process, so the more visible you can make your UX and technical communication teams/labs, the more effective you will be at introducing essential interventions early in the process. I have been invited to consult on projects because of my work on other projects, but I also end up connecting with projects because I tell people what I do for a living when they ask. I met the lead scientist for the DroughtSim project through a leadership group at my university. And the latest project I consulted on was with a volcano research group in which one of the members happened to swim in the lane next to me during our morning master’s swim group.

Step 1) Use UX research methods (surveys, interviews, etc.) to discover what users have experienced (what expertise they’ve developed) about the general subject you’re working on, including what they already know, what they want to know, and what they think others should know. This research will form the basis of

<table>
<thead>
<tr>
<th>COMMUNICATION FACTORS</th>
<th>VISITOR FACTORS</th>
<th>COGNITIVE STATE</th>
<th>ORGANISATION OF CONTENT</th>
<th>CONSEQUENCES</th>
</tr>
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<tbody>
<tr>
<td>1. Variety/Change</td>
<td>1. High interest in content</td>
<td>1. More learning</td>
<td></td>
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<tr>
<td>2. Uses multisensory media</td>
<td>2. Low levels of fatigue</td>
<td>2. High satisfaction</td>
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<td>4. Use of questions</td>
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<td>5. Visitor control/ Interactive exhibits</td>
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<td>6. Connections to visitors</td>
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<td>7. Good physical orientation</td>
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Figure 6: A model for ensuring mindfulness in the experience of museum visitors (Moscado, 1999).
the public expertise you will start from as you bridge over to the knowledge that the scientists bring to the experience as well. As both our interviews, and the results of a survey from the watermain.org confirmed (Grainias et al., 2018), users aren’t always aware of what they may want to know about a topic, so it’s better to start by finding out what they value and what personal connection they have to it. This research should happen very early in the process and data should be collected in a systematic way that can be used to defend future design decisions.

**Step 2) Interview scientists to discover the goals and outcomes scientists have for users.** This shouldn’t be confused with what knowledge they have to share. You will want to ask about that, obviously. But equally important are what outcomes they would like to see for users: what should users be able to do with their experience? How do scientists hope users will think and feel and act? This will provide a holistic scope for the UX team and be useful information to help justify design choices.

**Step 3) Put aside any product or interface that was developed before talking to users.** You may return to it later, or it may inform the ultimate direction the project goes in, but as it is entirely the product of the scientists’ knowledge, it is, at this point, only a partial perspective.

To illustrate why this is important, when our UX team was asked to consult on a different project in which scientists were building a tool to help low-income users lower their utility costs, we found that the scientists had already begun to design the application and its features before talking to any users; they had even gone so far as to develop personas without actually talking to any people. However, when we showed them results of our user testing from the DroughtSim project, the scientists were persuaded to halt all development until they had a chance to talk to actual users from their target user groups. DroughtSim was a project they admired, yet after hearing how confused users had been, they didn’t want their project to generate the same levels of frustration.

**Step 4) As you begin to brainstorm user flow and design ideas, start with what users know and have experienced (user expertise) as the very first thing they interact with in your interface, product, or exhibit.** This can be done using imagery, language, and questions that they can relate with and understand. This will ensure buy-in, and a sense from the user that their perspective is valued and appreciated. For instance, one successful element of the DroughtSim was the one-minute introductory video that users watched before beginning the simulation to orient them to the wide range of ways people typically interact with water. I worked with the scientists on the script for this video to make sure that the language they used was not too technical or abstract, and that the points being made were paired with images that illustrated what was being narrated. The script for the video made direct reference to recognizable and tangible places and things that people associate with their experiences with water.

But connecting in tangible ways with users also means avoiding value propositions. For instance, important to the success of the video was our careful editing of a point in the video that discussed environmental consequences of drought. The health of the environment has become associated with certain political values that might not be shared by all users; thus, we made a key change to the script that attempted to avoid “taking sides.” The original sentence stated: “The environment is usually at the end of the water line and thus often natural wetlands and streams suffer from reduced water supplies.” To paint a more human-inclusive picture of the consequences of drought on the environment, we revised the sentence to read: “Water for the environment supports fish and wildlife habitat and provides recreation opportunities.” This change did what David Kahan (2010) recommends, which is to redirect our emphasis from an abstract (and often controversial) discussion of values (e.g. the environment as victim to harmful human action), to one that discusses activities the audience is more familiar with. In other words, people may respond skeptically to a discussion about how lower levels of water cause the environment to suffer. But by framing the discussion in terms of people’s ability to participate in the water-based outdoor activities they enjoy (e.g., using rivers and lakes for fishing and recreation), people who may have seen the environment as something that existed in competition with their other water needs, now see how drought might negatively affect their more concrete experiences—like their ability to recreate outdoors.

Virtually every user we interviewed, when asked about the video, said that they had enjoyed watching it and that it was just the right length. Users didn’t cite learning much new information from the video, and said that they at least were not confused by it and reported enjoying its content.

**Step 5) From the initial connection point, architect the remainder of the experience using conditional or skip logic.** This is a common survey design technique used to combat survey fatigue by programming a survey to adapt subsequent questions or content based on the responses that users provide (Lauer, Blythe, McLeod, 2013). Valuing a user’s expertise means starting with what they know and have experienced. But users don’t all know the same things, nor do they want to learn the same things. Skip logic can accommodate a wide range of starting points and proceed toward common learning outcomes. For instance, I am aware from the results of our user research that people don’t generally know how much water they use daily nor are they aware what proportion of a community’s water supply is used by people use vs. farmers vs. industry. Rather than asking these questions directly, you could design an interactive experience where you ask users to pour water from the well into various buckets with “people” “farmers” and “industry” user labels. Then, you could program the interaction to respond to their inputs using actual averages from their region, followed by explanations as to where water comes from and how water use has changed over the past twenty years. You could then focus specifically on the area where the largest disconnect seemed to occur. For instance, several participants we interviewed suggested that local housing development was responsible for most of the stress on our water system. They were surprised to see that, in their area, farming was actually responsible for 75% of all water use.

**Step 6) Test with users early and often, and in context.** Testing in context can make you aware of all kinds of environmental factors that may interfere with the ability of users to interact with your installation, from volume, to power supply, to internet reliability, to other issues. Had our team not visited the museum itself, we would have missed several obstructions that we never anticipated would prohibit users from interacting successfully with the exhibit.

**Step 7) Acknowledge the limitations of scientific data** when communicating to non-scientific audiences about scientific issues of global importance. Scientists typically value accuracy and credibility above all else. It can thus be challenging to adapt
science so that it connects to what an audience might value from the experience. Scientists may see compromising on the complexity of content in science communication as compromising on the science itself. A transactional design process begins with a user’s expertise and bridges the gap between how users want to be able to act and what scientists have to teach to make that action meaningful. Users bring their own knowledge, experiences, and desires to the data scientists have to share which, together, can engender meaningful change.

Step 8) Make the case to funding agencies that this work is valuable and establish your UX work as the science that it is. User testing takes time and making changes to existing systems takes money, and not all scientists will write this kind of work into a grant proposal. Having said that, there are areas of funding in grants that can be shifted to accommodate new work, so you can ask about those. Our team initially worked pro-bono, but after the scientists recognized the value we were bringing to the process they found money in their existing grant to fund our work.

The bigger concern is that until funding agencies require that scientists build effective, public-facing science communication projects into their grants, scientists are not professionally rewarded for this kind of work nor might they consider it even to be “science.” For example, I was sitting in a presentation with the scientists from the center and representative from the NSF to which we were reporting about the activity that the center had completed on the grant over the year since the NSF had last visited. The director of the center gave me the opportunity to present the museum installation and classroom interfaces we had developed and discuss the user research we had conducted and the recommendations we were making to improve the interface. However, when the director transitioned from my discussion of the interface to another research area that the grant was funding, he said, “and now getting back to the actual science...” (personal communication, September 17, 2018).

I was struck by this phrase because I knew the director was impressed by what the UX team had accomplished. But he was talking to a funding agency that had not given money to support this “softer” activity and I assume he felt compelled to reinforce that the money the center had been awarded to complete scientific research was funding hard science. Our UX design and research work had not been part of the grant and it was not how the center would be assessed on their delivery of what the NSF had given them money to research. It was not considered actual science. This misconception is not likely to change until technical communication and UX designers successfully lobby funding agencies to require public-facing science communication projects and evaluate the effectiveness of those communications using valid UX methods.

It is thus essential to establish your UX work as a science that speaks to systematic data collection and validity. Employing valid methods to study the effectiveness of science communication shows UX research to be the science that it is. Our team demonstrated our value not just through our initial recommendations and design experience, but by conducting our UX research in a systematic manner. We designed valid user studies; we collected rich, meaningful data. We presented our findings accurately and professionally. Eventually, we were encouraged to get involved in writing grants and articulating how UX should be included in the grants scientists wanted to write. Knowing that scientists are not practiced in making the case for design and UX makes it especially imperative for UX professionals to be proactive in articulating how much of a grant should be spent on the design and testing of a system and why.

But this advocacy can start at the organization level as well. We are currently working with our technical communication and UX master’s programs to develop a slide deck and pamphlet themed around what UX can bring to science that we plan to distribute to departments across our campus. In it, we show our understanding of science and the values of scientists we’ve worked with. We also communicate how important it is to understand the user. We highlight the particular expertise we have in doing so and discuss our research methods to make UX seem like the science that it is, instead of some friendly gesture or cosmetic exercise.

CONCLUSION

Public-facing science communication projects carry tremendous potential to shape the way members of the public think and act about issues of local and global consequence. The transactional design checklist I present in this paper provide a way forward through some of the common challenges that may arise in working with scientists on public-facing communication projects. Valuing users’ expertise, as a combination of their lived knowledge and experience, is essential to the success of any science communication project. As this expertise is not typically recognized by scientists, the transactional design checklist will help technical communication and UX specialists be more strident advocates for users.

The future of our very planet rests upon the policies that our global leaders enact in response to the pressure applied by their constituents. As the most vulnerable communities around the globe will be hit the hardest by climate change, infectious disease, and other global issues, ensuring mindful public communication of science through a transactional design model is nothing less than an issue of social justice. Connecting global publics to scientific knowledge will ensure that people have equal access to the tools and information they will need to advocate for positive and meaningful change in their communities. Myriad outlets exist that have the potential to provide people with engaging access to scientific knowledge, but they must be designed in an engaging way that connects to a person’s existing experience. Technical communication and UX specialists must work with scientists to design experiences that can achieve this.

ACKNOWLEDGEMENTS

I would like to thank the scientists and administrators who initiated the DroughtSim project for giving me the opportunity to work with them. I would like to thank Madhura S. for her generous design work contributing to the interface design and instructions board. I would also like to thank Robin C. for her research with visitors in the southeastern U.S. and her development of personas from that research. Finally, I would like to thank the many other graduate and undergraduate students who participated in user researching the DroughtSim.

ENDNOTES
1. A pseudonym
2. A pseudonym

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Along the Cow Path: Technical Communication Within a Jewish Cemetery

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ABSTRACT
Technical communication and user experience studies traditionally uphold Western onto-epistemological distinctions between technical users and objects. Recent calls for the inclusion of cultural approaches to technical communication, however, have asked scholars to consider the influence cultural knowledge has on communication design. This article takes up these calls by reading technical documentation through new materialist and Indigenous ways of knowing. Using a prominent Jewish cemetery in Gainesville, Florida as a case study, this article treats technical artifacts and subjects as co-constitutive, arguing for the cultural and material agency of technical documentation design in mediating and shaping user experience.

CCS Concepts
CCS → Social and professional topics → User characteristics → Cultural characteristics

Keywords
User experience; cultural rhetorics; new materialism; community; localization

INTRODUCTION
On August 27, 1871, twenty year old Abraham Pinkussoun died and was buried in what would become one of the oldest Jewish cemeteries in the state of Florida: an area “along a ‘cow path some distance from the nearest dirt road,’” according to local Jewish historian Samuel Proctor (cited in “History of B’nai Israel Cemetery,” 2015). Aside from transcribed oral history about when Abraham died and where he is buried (see “Gainesville’s Jewish Cemetery,” 2015; Lowenstein, 2013; Proctor, 1990), little is known about him.

What is presently known about Abraham may be abstracted from two technical documents. The first is Alachua County’s 1870 census record. At the time, Abraham was nineteen years old and working as a clerk in the dry goods section of his father Pinkus Pinkussoun’s grocery store (“United States Census, 1870,” 1870). This piece of technical documentation notes that Abraham was born in New York, the oldest of ten children, White, not enrolled in school, and eligible to vote. Whatever else may (at least for now) be known about Abraham comes from his headstone. Abraham’s marker is the first gravestone in the B’nai Israel Cemetery, an acre of land Pinkus and a man named Gerson Joseph originally purchased and named the “Gainesville Jewish Cemetery.”

The Gainesville Jewish Cemetery serviced the two-dozen Jewish families living in Gainesville, Florida, in 1871, half of which (including the Pinkussouns) relocated elsewhere by 1880 (“History of B’nai Israel Cemetery,” 2015). Despite not belonging to a Jewish congregation, the cemetery became the resting spot for many of Abraham’s contemporaries. In 1946, the cemetery was tied to a congregation in Gainesville when the “district court officially transferred its supervision to the trustees of B’nai Israel” (“History of B’nai Israel Cemetery”), a local Conservative synagogue. Today, the cemetery’s property line has expanded to include some 300 remains as well as the Gainesville Holocaust Memorial. While we do not know with certainty how accessible the original cemetery was for Gainesville’s Jewish community, the present-day B’nai Israel Cemetery has grown into a space reserved for Gainesville’s Jewish population through technical, bilingual (i.e., Hebrew and English) documentation design.
While technical communication is broadly understood as the production and/or study of specialized documents, cultural approaches to technical communication are increasingly being incorporated into the field. In their article “Interfacing Cultural Rhetorics: A History and a Call” (2018), Cobos et al. posit that cultural rhetorics is intimately connected to how scholars make cultural interventions in fields like technical communication:

[W]e posit that rhetorical inquiry often treats culture as an object (or context), as a process (or assemblage), or some combination of the two. In relation to these interfaces, scholars often locate culture in terms of language, identity, custom, religion, or other forms of social organization and/or distribution. (p. 141)

Technical communicator and cultural rhetorician Angela M. Haas further characterizes these social organizations and distributions in her contribution to the article as “material and information flows within the network(s)” of technical communication (p. 146). Haas suggests that technical documents are cultural objects energized within material and informational assemblages or communicative networks. More specifically, Haas pushes technical communicators to engage in rhetoric or the negotiation of cultural information and values to make explicit how “subjectivities, positionalities, and commitments to particular knowledge systems are interrelated and situated within networks of power and geopolitical landbases” (p. 145). A cultural approach to technical communication, in other words, has the potential to widen the spaces in which technical communication emerges, a central tenet of this article.

Following Cobos et al.’s call to recognize cultural rhetorics’ contributions to our disciplinary research and practices as well as Angela M. Haas’s push to explore the potential of using cultural rhetoric frameworks in promoting different arenas of knowledge, I propose treating cemeteries as important sites of technical communication. Cemeteries are generally treated as spaces that accumulate technical documents (e.g., gravestones or memorials) designed to circulate information about a cultural community and their loved ones over time (see Yancey, 2018; Wright, 2005). Because technical communication and documentation are culturally informed meaning-making processes (Jones, 2016; Evia & Patriarca, 2012; Selfe & Selfe, 1994), technical documentation design and function vary within cemeteries created by different cultural groups. As spaces made from the assemblage of different cultural and material documents, cemeteries circulate technical information through the material and symbolic or rhetorical mediation of visitor activity while interfacing specific cultural registers. We might look to the B’nai Israel Cemetery’s front gates to catch a glimpse of this process.

Both entrances to the B’nai Israel Cemetery are held shut by a lock whose combination is inscribed onto a nearby sign, represented by a space open to any Jewish visitor, I hope to both honor and learn about the cemetery. By practicing standard observational qualitative research methods while embodying Jewish values and practices in a space open to any Jewish visitor, I hope to both honor and learn...
from Gainesville’s historical and contemporary Jewish community. At the same, I intend to share a model for understanding how non-Western, culturally rooted ways of thinking and being expand traditional understandings of how technical documents engage with or influence technical users.

This article has four parts. I begin the article by detailing my theoretical framework, taking an interdisciplinary approach to technical communication by weaving together conversations surrounding user experience and intra-activity. Afterward, I discuss how technical documentation mediates human activity within cemeteries, suggesting that gravestones are culturally networked multimodal objects of technical communication. In the third section, I rhetorically analyze B’nai Israel Cemetery’s technical documentation through a user experience and cultural rhetorics approach to technical communication. I then conclude this article by discussing the implications of my work in further explicating the relationship between technical communication and cultural rhetorics.

USER-EXPERIENCE AND INTRACTIVITY

Because we are interested in how cultural documentation design illuminates the ways in which the Gainesville Jewish Cemetery might have met the Pinkussouin family and their community’s needs, this article is heavily informed by user experience studies. User experience, a field often connected to technical communication, emphasizes evaluating technical objects by comparing their intended and actualized usages (Rose et al., 2017; Campbell et al., 2016; Sun, 2006). Although user experience methods and methodologies are often tied to the processes behind an object’s design (Rose et al., 2017; Campbell et al., 2016), technical communication scholars like Huatong Sun (2006) contend that users are themselves designers who, through a process she calls “user localization,” engage with objects in potentially subversive manners to meet their rhetorical needs (p. 458–459). As she explains in her article, “The Triumph of Users: Achieving Cultural Usability and User Localization” (2006), a product’s usability originates from “tool-mediated production and sign-mediated communication. It [usability] is both (a) a material interaction with the artifact and its contexts and (b) an interpretation process of this activity” (Sun, p. 466). A technical artifact’s usability is therefore always under negotiation as users engage the artifact materially and symbolically to meet their localized needs.

Underlying Sun’s (2006) approach to user experience is the notion that technical artifacts contain social and material energy. Discussing mobile messaging technology, Sun observes that information technology products are not usable when their designs are not informed by “postadoption user experience at the users’ sites” (p. 477). In other words, an object’s materiality has the potential to shape, enhance, and/or limit how users rhetorically interact with the object through meaning-making processes like mobile text messaging. Similarly, as a technology for storing, retrieving, and sharing information, burial plots—like the one pictured in Figure 2—guide a user’s experience with the deceased through the culturally informed arrangement of cemeterial objects.

A user’s experience with the burial plot pictured above principally begins with and is, therefore, guided by the material arrangement of three objects: a headstone, footstone, and plot fence. The arrangement of Alfred Simonson’s headstone and footstone show how the deceased’s body is positioned, information that might have been important to the Simonson family if they believed, as the prominent Jewish philosopher Moses ben Maimonides and others since have reasoned, that “the soul resides in the recesses of the brain, flows through the blood, and so reaches the various parts of the body” (Mizrahi, 2011). Knowing or even addressing where the soul was chiefly seated might have been significant for the family, hinting at the potential relationships users form with technical information when it is situated within a cultural framework. Some mourners engaging with the brick fencing, for example, might see it only as a way of preventing visitors from walking atop the deceased or to prevent heavy rains from unearthing the grave. Mourners with a larger pool of Judaic religious and cultural knowledge, however, might see the fencing as a signpost for the Kohen, individuals who, because of their ancestral relationship to the sons of Aaron, are prohibited from coming within a certain distance of the deceased (see Sefaria, Leviticus 21:1). Alfred’s plot is rhetorical because, to use George A. Kennedy’s (1992) language, its material composition can “be identified with the energy inherent in communication,” namely the “energy level coded in the message” (p. 2). Just as the energy coded into a plant’s “coloration and scent” rhetorically attract or repel animals (p. 10), the cultural energy coded into the organization of the objects pictured in Figure 2 connect user experience to material assemblages.

The term “assemblage” as used here refers to the idea that the “agency of human subjects is dispersed and/or dissipated across a network of actors and things” (Dillon, 2013, p. 174). Material objects have the ability to act on or with human bodies in ways that are co-constitutive (Dillon, 2013; Bennett, 2010; Barad, 2007, 2003). Our agency or ability to act as technical communicators arises from what feminist physicist Karen Barad (2003) calls “agential cuts” or momentarily stabilized moments of “intra-activity” (p. 815), a term that acknowledges the “ontological inseparability” of objects and describes an ongoing co-constitutive relationship in which objects and activity are produced (Barad, 2007, p. 128). Intra-activity, in other words, is a phenomenon that produces human and non-human objects as well as human and non-human agents through their assemblage or material entanglement. Agential cuts and intra-activity are symptomatic of agential realism or the ontological position that “individuals do not preexist their interactions; rather, individuals emerge through and as part of their entangled intra-relating” (Barad, 2007, p. ix). A user’s intra-action with cemeterial objects like headstones and footstones creates an agential cut in which culturally informed symbolic and material phenomena is produced in the form of grieving and remembrance. It is through
this phenomenon or intra-activity that technical communicators become mourners and information technologies become grave markers. Aligning with Indigenous modes of thinking and being that consider the agency of matter (see Rios, 2015), agential realism positions technical documentation as mediators of user experience, acknowledging a technical artifact’s potential to act in a co-constitutive and communicative manner.

The desire to see material objects as having intra-active agency can presently be found in scholarship on technical literacy, the rhetorical processes of interpretation and communication behind a technical document’s usability. For instance, Gabriela Raquel Rios (2015) argues for the value of embodied knowledge in acts of interpretation and communication through agricultural practices. Rios’s work on what she calls “land-based literacies and rhetorics” (p. 60) opens the possibility of seeing farming tools like hoes and shovels as important actors in the process of attaining literacy. More strikingly, Angela M. Haas (2007) observes that the technology woven into wampum belts—Indigenous, non-alphabetic technologies for recording and retelling narratives—has “communicative agency, as with the colors of the shells and the design patterns” (p. 91). A wampum belt’s material composition and symbolic design constitute its communicative potential, suggesting that the intra-action between an object’s individual parts shape user experiences in ways that enable technical documentation to act or communicate through the mediation of human activity.

Haas’s observation is particularly useful for thinking about how the different elements of a cemetery plot mediate user experience. We might, for example, see the placement of the surname “RESNICK” between the headstones pictured in Figure 3 as creating a visual and symbolic linkage between the deceased and the Resnick family.

The placement of a divot sporting a Star of David invites viewers to recall the cultural significance of the yahrzeit candle—a candle lit in memory of a deceased individual—before possibly prompting them to leave a lighted candle behind, regardless of whether or not that is the object’s intended usage. After all, with the appropriate cultural knowledge needed to know that flowers are not typically left behind at Jewish graves, users might reasonably localize the divot’s design to meet their cultural needs. Each of these agential cuts creates technological subjects (i.e., mourners) and technical documents (i.e., headstones) within a cultural framework. A gravestone’s communicative potential as a technical document within a cemetery plot stems from its culturally informed material mediation of user experience.

**Figure 3: Frederick and Irene Resnick’s joint plot in the B’ni Israel Cemetery. Each tablet features the deceased’s respective Hebrew name and ends with his or her role as a member of the Resnick family. In the center is a candleholder marked with the Star of David.**

**TECHNICAL DOCUMENTATION AS TECHNICAL/TEXTUAL MEDIATION**

Drawing from Sun’s (2006) definition of articulation as “a process of creating connections between various contextual factors on the level of practices and on the level of meanings” (p. 463), I view mediation as a process through which technical documentation intra-acts with users to produce and sustain cultural and communicative activity. Mediation in this sense is guided by a user’s experience with technological artifacts in specific cultural contexts. As cultural rhetoricians Ellen Cushman and Shreelina Ghosh (2012) explain,

> [Mediation] is the place where people act within structures, where these actors’ dispositions both follow and lay the tracks of organized behavior…and where micro material realities and practices meet the macro of stabilized behaviors. Mediation—central and necessary to the practices that unfold in these spaces of stabilized behavior—can be understood as both sign technology use and enactment of stabilized behavior at once. (p. 267–268)

Discussing the digitalization of the Cherokee stomp dance and classical Indian dance, Cushman and Ghosh discern that mediation influences people, activities, and objects through “sign technologies or representational tools” and the material embodiment of cultural or social behaviors and practices (pp. 266, 267). An embodied “process and product of meaning making…located in time and space” (p. 267), our definition of mediation follows a similar logic: through their material entanglement, technical objects and users both embody and create material cultural artifacts and behaviors. Within the context of cemeteries, headstones mediate user activity to produce embodied cultural practices, such as the Judaic practice of leaving stones rather than flowers atop graves to—as the common abbreviated inscription “ת נ צ ב ה” on headstones would suggest—“bind the soul in the bonds of eternal life” or prevent their memory from being forgotten. In turn, the act of leaving stones atop grave markers sustains the technical document’s communicative potential.

The idea that technical documentation has the potential to mediate physical and symbolic activity is not at all new to technical communication studies. Johnson, Pimentel, and Pimentel (2008) contend that the New Mexico Bureau of Immigration used pamphlets and other technical documents to distort Indigenous oral histories in ways that appealed to White settlers, allowing the bureau to seize ownership of Indigenous New Mexican history to promote immigration (pp. 211–212). Similarly, Dragga and Voss (2001) consider how technical illustrations might better “promote a humanized and humanizing understanding of technical subjects,” touching on how visual communication mediates readers’ humanistic understanding of graphical information (p. 266). But, because materialism shifts our “attention away from individuals and onto actants in assemblages” (Bennett, 2010, p. 42) such that individuals do not pre-exist material intra-actions, we need to expand previous understandings of technical mediation by situating technical communication within a cultural network of material agents.

Borrowing from social network theory, an interdisciplinary field of study dedicated to mapping social relationships, a “network” is used here to denote a system of intra-activity or “ties” between spatially situated “nodes” or cultural actors (see Grandjean, 2016; Grunspan, Wiggins, & Goodreau, 2014; Freeman, 1978/79). The extent to
which these objects are in communication may be seen as relating to the notion of “betweenness centrality,” the idea that the strength of a node’s position in a system or network can be determined by measuring its distance from one or more nodes (Grunspan, Wiggins, & Goodreau, 2014, p. 170). Rather than using spatial distances to measure the intensity of communication between two or more human or non-human agents, a more dynamic approach is to evaluate cultural connections or cultural distances between nodes. As hypertextual networks, wampum belts remind us that materialized cultural connections are what enable technical objects to communicate embodied information. Describing wampum belts’ rhetorical materiality, Haas (2007) explains that a wampum belt’s nodes and pathways between nodes are readable only to individuals who can understand each node’s cultural significance: “The color usage of wampum reminds its ‘reader’ how to organize and read the story woven into the material rhetoric…In order to retrieve the encoded communication, an individual must be a part of the community with the cultural context for accurate retrieval of that information” (p. 86). The cultural knowledge and activity guiding a wampum belt’s design is materialized through the hyperlinking or networking of specific nodes (e.g., colored beads or shells) by hand. Wampum belts communicate embodied or materialized knowledge by presenting a visual map which can be read by orators able to perceive the cultural connections between nodes.

Although culturally and historically distinct from wampum, cemeteries similarly embody localized cultural knowledge or practices over time through the organization of human and non-human bodies. This knowledge is then circulated across cultural networks for visitors to “read,” mediating our activity in a manner that reifies the space’s material, mass, cultural, and textual meaning. When members of the Jewish faith are materially prompted by the technical documentation around them to leave stones atop graves as a sign of material remembrance, our cultural activity is embodied in both the headstones we visit and the stones we leave behind. A mourner’s mediated activity materializes the symbolic significance of cultural practices and beliefs within a network of actors. Participating in fluid networks of cultural and material intra-actions enabling gravestones (i.e., nodes) and cemeteries (i.e., networks of activity) to serve as sites of technical documentation and communication. We might therefore see technical communication as a field of inquiry made from culturally vibrant human and non-human actors, actors who are produced within culturally informed assemblages of technical documentation through various iterations of physical and/or symbolic mediation. In short, technical documentation is itself an active participant in circulating and sustaining the technical communication of cultural information.

THE B’NAI ISRAEL CEMETERY: A CASE STUDY

Headstones, tombstones, and other grave markers are technical documents produced through the material assemblage of cultural artifacts. Kathleen Blake Yancey (2018) explains that within cemeteries an “assemblage…assumes a borrowing, a circulation of textual materials, with each tombstone tablet providing a temporarily stable site for the circulation of visual and verbal material that collectively remember, honor, and comment on the deceased” (p. 61). In other words, headstones are multimodal technical documents designed to circulate information about or representations of the deceased by tapping into a cultural reservoir of “language, images, layout, and so on” (p. 64). Cultural commonplaces in Jewish headstone design connect individual nodes within the B’nai Israel Cemetery by drawing from the localized social energy animating Gainesville’s evolving Jewish community and their documented history or memory. As Wright (2005) explains in reference to a peripheralized Black cemetery in Portsmouth, New Hampshire, cemeteries as rhetorical storehouses for a public’s memory are “always reflecting, contesting and inverting the [wider] society from which they come” (p. 71–72). To both better understand the cultural energy embedded in the B’nai Israel Cemetery and give justice or tzedek to Abraham’s memory, we need to explore its users’ social and political context.

Technical communication and user experience scholarship centered on communication design are often invested in user-localization or “the specific activities and strategies users employ when communicating to meet their culturally situated needs” (Gonzales & Zantjer, 2015, p. 272). Abraham Pinkussoum and his contemporaries’ culturally situated needs were tied to their complicated identity as refugees. The nineteenth century saw a mass exodus of Jews leaving Europe for the United States due to racial and religious persecution (e.g., anti-Jewish riots and segregation) (Zerivitz, 2020, p. 33), stemming principally from their racial status as “Semites” (Goldstein, 2006, p. 16). In his book The Price of Whiteness: Jews, Race, and American Identity (2006), Eric Goldstein observes that the racial status of Jews in America during the nineteenth century often fluctuated between being a point of pride or derision:

While unflattering racial caricatures of Jews were familiar in nineteenth-century America, positive racial images were at least as common. Non-Jews frequently spoke in complimentary terms of the Jews ‘as a race,’ emphasizing their thrift, commercial success, and community mindedness. (p. 17)

Depending on the status of the economy or a particular population’s attitude toward Jews, a Jewish-American’s “community mindedness” could also be read as “clannishness,” a common justification for segregating Jews from certain social spaces (see Goldstein, 2006). European Jewish immigrants—like the Pinkussoums—could therefore be accepted by some White communities and denied by others according to how close or distant local Jews were to concepts of Blackness or Whiteness, respectively.

Whereas racial tensions in America can never be simplified into a Black-White dichotomy, “white Americans often tried to understand Jews and other European ‘racial’ groups within a black-white framework as a means of suppressing the troubling uncertainty they represented” (Goldstein, 2006, p. 41). Although Jews, in certain regions and at certain times, were thought to have been inferior to their Black counterparts (p. 42), this does not seem to have been the case in Florida. Florida census takers classified Abraham Pinkussoum and his family as White (United States Census, 1870), suggesting that some members of Gainesville’s early Jewish population were afforded certain (White) privileges. Skin-color in this instance may have had an impact on how the Pinkussoums were treated in Gainesville during the nineteenth century. Jewish settler-colonists’ culturally situated needs in Gainesville, Florida were likely centered on their identities as White-passing racial and religious refugees.

While exile has, for many Jewish communities, profoundly shaped their identities (Bernard-Donals and Fernheimer, 2014, p. vii), it is important to note that Jewish Americans arriving on native
Seminole and Timucua land (i.e., Gainesville) benefited from Black suffering as well as the eradication and/or displacement of native populations. Some Jewish settler-colonists indirectly benefited from the forced labor used to colonize Indigenous land, while others—like Moses Elias Levy—used Black enslaved labor to create “a refuge for European Jews fleeing the pogroms and restrictions of the post-Napoleonic era” (Zerivitz, 2020, p. 13). Despite their status as a scapegoated minority, early Jewish settlers living in Gainesville used their White privilege to tap into White power structures to benefit themselves and their community.

Ignoring the critical intersections between Jewish, Black, and Indigenous history in Gainesville would only serve to erase the living in Gainesville used their White privilege to tap into White power structures to benefit themselves and their community.

By virtue of being the first grave in what would become Gainesville’s B’nai Israel Cemetery, Abraham Pinkussouen’s tombstone (Figure 4) lays the literal foundation for the cemetery’s cultural circulation of technical information. Abraham’s headstone visually communicates that its primary audience can read Hebrew, evinced by the spatial difference in surface area between the document’s Hebrew and English text. The designer’s decision to write in Hebrew without using punctuation as is done in the Torah (or the Old Testament) and other texts for adults would further suggest that the text’s intended audience has a cultural familiarity with the language, one often achieved in Diaspora through an involvement in religious life. Moreover, both portions of the text pictured in Figure 4 are wrapped in a carving depicting what looks to be a plant in bloom, an image that for Jewish viewers meditates their symbolic activity by calling to mind the declaration in the Torah that “‘all flesh is grass, and all its goodness like flowers of the field: Grass withers, flowers fade…Indeed, man is but grass’” (Sefaria, Isaiah 40:6–7). If flowers and grass are transient like the human body, then the decision to picture in stone a blooming plant and/or lively greenery signals the longevity of Abraham’s memory to readers with the relevant cultural rather than purely linguistic knowledge.

Figure 4: Abraham Pinkussouen’s tombstone in the B’nai Israel Cemetery. The image on the right has been digitally edited for legibility.

As a tenet of Judaism, memory connects members of different Jewish communities to a shared past, creating a sense of peoplehood (see Bernard-Donals and Fernheimer, 2004). For example, the Torah commands that “in every generation a person must view himself [or herself] as though he [or she] personally left Egypt” from bondage (Sefaria, Pesachim 116b). The bonds forged between different Jewish communities, however, honor differences by invoking “the relationship of the individual to the community or that of an insider group to an outside group” (Bernard-Donals & Fernheimer, 2014, p. xiv). By writing Abraham’s memory in both Hebrew and English, the gravestone pictured above attends to his community’s shared cultural history and language while also observing its relationship to the outside English-speaking world. Although a sizeable amount of Jewish Americans today no longer read Hebrew fluently (including myself), we continue to leave Hebrew inscriptions on our headstones to connect each generation to one another through a legacy of tradition. The rhetorical assertion of the community’s uniqueness through its linguistic and cultural differences prevents the group’s cultural identity from being erased.
Although technical representations of Abraham’s memory are detailed largely in Hebrew, the text’s shallow blocky lettering render it practically illegible, demonstrating perhaps the need for a tactile form of embodied literacy. As a digital text or a text produced by “fingers, our digits” (Haas, 2007, p. 84), a visitor might read the shape of the tactile sensations each indentation produces on his/her/their fingers. But with the help of a closely-linked network of interested rabbis and other Hebrew speakers in or from Brooklyn, New York, who wish to remain anonymous, the following transcription and translation were put together with some difficulty:

The text is strikingly intimate, with Abraham’s mother and father addressing their son before turning their attention to their audience by writing about their son in the second person. The gravestone goes on to say in English, “To the memory of our beloved son Abraham Pinkussoun / Born in New York Jan. 28, 1851 / Died in Gainesville FLA. Aug. 27, 1871 / Aged 20 yrs. and 8 months / May his soul rest in peace. Amen” (“Abraham Pinkussoun’s Gravestone,” 1871)

The text mediates the visual activity of outsiders by displaying nothing more than a wall of illegible etchings, hiding for example that “Abraham Ben Pinkus” or “Abraham son of Pinkus,” who died on 10 Elul 5631 (i.e., August 27th, 1871), was not only a “Rabbeinu Aryeh” or “teacher of strength” but was also “known by everyone who saw him as a charitable man” (“Abraham Pinkussoun’s Gravestone,” 1871). Culturally meaningful representations or memories of Abraham are compartmentalized, with the only information given to outsider groups being mostly Westernized factual knowledge (e.g., Gregorian birth and death dates). Like the sign pictured in Figure 1, Abraham’s tombstone mediates viewer activity by hiding and/or revealing cultural knowledge, intra-acting with users to invoke their identity as members or outsiders to the community while also marking the cemetery as a primarily Jewish space.

The document’s bilingualism “contribute[s] to cultural knowledge production and preservation” (Haas, 2007, p. 91), circulating and hiding cultural meaning. Abraham’s headstone mediates user activity by asking its target audience to switch between Hebrew and English, modeling or embodying the lived experiences of Gainesville’s early Jewish population, many of whom navigated violent social structures within English speaking communities. By understanding the stark contrast between what is and is not circulated to outside groups, Jewish users better understand their and their community’s contemporary and/or historical relationship to the larger Gainesville and Alachua County area. Because technical representations of Abraham’s memory functionally invoke insider and outsider groups, circulating and obscuring the production of knowledge in a manner that signals the space’s cultural identity, Abraham’s “voice” materially and culturally reverberates wherever memory serves to create a sense of peoplehood through difference.

A Cultural Network of Material Voices

We find subtle circulations of Abraham’s memory within the cemetery through objects like Gainesville’s Holocaust Memorial (Figure 5), a large pillar physically disrupting a walkway’s otherwise linear path. According to Carol Blair (1999), “rhetoric’s materiality constructs communal space, prescribes pathways, and summons attention, acting on the whole person of the audience. But it also allows a rhetorical text to ‘speak’ by its mere existence” (p. 48). Defining material rhetoric as any partisan or meaningful text, with the term “text” referring to interpretable objects or events (p. 18), Blair describes how material objects like monuments and memorials can communicate cultural knowledge by physically mediating user activity. The Gainesville Holocaust Memorial in

Figure 5: The Gainesville Holocaust Memorial in the B’nai Israel Cemetery. Not pictured are two memorial benches with the following inscriptions: “In Loving Memory of the Victims” and “We Remember ידידי us. Inscribed on the memorial is the following: “IN MEMORY OF THE SIX MILLION / I shall give them in my house / And within my walls / A memorial and a name… / Isaiah 56:5.”
particular mediates visitors’ bodily movements in physical space, imposing itself onto viewers in an intra-active process capable of producing activity, namely actions that inspire or call attention to forms of remembrance.

Displayed at a slant for the viewer’s benefit, a two-thirds completed Star of David decorates the top of the granite memorial. The cultural iconography is meant to call to a visitor’s mind a memory of the six million Jews (one-third of the world’s Jewish population) murdered in the Holocaust (JOLA, 2015). Hence, the Star of David mediates the viewer’s visual and symbolic activity, turning the stone into a memorial and the viewer into a mourner. At the same time, a user’s bodily activity is being mediated as well, with the memorial redirecting the area’s communal space in a manner that forces visitors to pass (and possibly sit on) one of the two memorial benches, each of which display words like “remember” and “in loving memory” (“Gainesville’s Holocaust Memorial,” 2010). The pillar’s intra-action with its visitors and the space around it materialize the memory of those lost in the Holocaust, prompting cultural activities that contribute to the space’s Jewish identity.

Tapping into cultural iconography while dedicating itself to the “memory of the six million” (“Gainesville’s Holocaust Memorial”, 2010), the memorial circulates Abraham’s memory by contributing to the cemetery’s enculturation, producing Jewish technical documents and users. Abraham’s memory can be found in the Gainesville Holocaust Memorial as well as the surrounding tombstones which circulate cultural iconography while mediating cultural practices (Figures 2 and 3), or even signage aimed at rhetorically choosing which users may or may not enter the cemetery’s memorial grounds (Figure 1). According to Elizabethada A. Wright (2005), “If one sees cemeteries as a rhetorical space, then there are thousands upon thousands of voices clamoring to be heard, a cacophony of remembrances calling out” (p. 60). As a rhetorical place of technical communication, the Gainesville Jewish Cemetery and its later iteration as the B’nai Israel Cemetery are in conversation with one another, culturally linked through the growing number of Jewish voices asking to be heard within the same plot of land. Although this article focuses on Abraham’s voice, each technical artifact within the cemetery adds a new voice into the space, building on and reinforcing Abraham’s memory.

What guides or organizes the echoing voices within the cemetery at the end of the cow path are the cultural connections they have to other nodes or technical documents, contributing to the cemetery’s status as a cultural network of technical communication. Each node circulates and recirculates Abraham’s memory through his technical representation, intra-acting with users and visitors to create a cultural space, where the past meets the present and a unique cultural memory is embodied through mediated activity. Creating a uniquely Jewish space through a shared sense of peoplehood, technical communication within the B’nai Israel Cemetery demonstrates what Kendall Leon (2013) describes in her work on Chincana rhetoric in community institutions as “the movement of collective change…working slowly through the nuanced internal work of an organization that was often not visible” (p. 172). Assembled slowly over time as the city’s peripheralized and at times privileged Jewish population steadily increased, the technical documentation collected within the Gainesville Jewish Cemetery represent artifacts of hidden user activity that change the area’s political landscape by making space for an ethnic, religious, and linguistic other (Figure 6).

CONCLUSION
Exploring cemeteries as important spaces of technical documentation illustrates how technical documents are intimately tied to their localized cultural context(s). Technical representations of the deceased are tied to cultural practices when they are materialized as symbolic objects like headstones or monuments, objects which tap into cultural reservoirs of knowledge through the circulation of cultural iconography or linguistic practices. The circulation and materialization of cultural knowledge enables technical documents to mediate physical (e.g., visual) and symbolic (e.g., translational) activity. Far from being an inert vehicle for communication, technical artifacts play an active role in technical communication, participating in an ongoing and co-constitutive process of intra-activity. By mediating our activity through cultural sign technology—like iconography and epitaphs—headdstones
prompt users to embody cultural knowledge through organized displays of respect, turning the document into a headstone and the user into a mourner. In short, technical communication should be seen as an embodied act of cultural circulation.

For the Pinkussoun family, the potential for technical documentation to embody Jewish cultural values enables Abraham’s otherwise lost memory to exist well into the present. Moreover, the physical existence of a space reserved for the circulation of Jewish customs and histories through technical communication empowers the local Jewish community by creating an area that, as the passcode to the cemetery gates suggests (Figure 1), gives chay or life. Our potential as technical communicators to empower different cultural communities stems from seeing technical documentation and technical users as co-constitutive. It becomes easier to understand how our technical artifacts “engage issues of power and legitimacy” (Jones, 2016, p. 2), when we step outside Western notions of being, as well as when we consider the complicating contexts in which these documents came to life.

Understanding that technical communication occurs not only in pamphlets but also in physical spaces like cemeteries creates greater exigence for the field’s attentiveness to both valuing and legitimizing the “experience and perspectives of others” (Jones, 2016, p. 6). Technical communication influences and is influenced by cultural rhetorics, with both disciplines widening one another’s disciplinary boundary. By rhetorically mediating user activity to shape a group’s cultural identity and collective memory, technical communication has the potential to empower members of diverse communities and enhance their voices across time and space.

ACKNOWLEDGEMENTS
Thank you to Laura Gonzales for the time spent helping me to refine my ideas for this article, as well as for encouraging me to pursue this line of research. A special thanks goes to my fiancée Shira Newman and her mother Michelle Miliffe for serving as sounding boards and community intermediaries. The anonymous members of the different Jewish communities who assisted in transcribing and translating Abraham Pinkussoun’s headstone will forever have my gratitude. I would also like to thank my father Robert Slotkin and my dear friend Katherine Hampshire for giving me feedback at different stages of the writing process. Lastly, thank you to the anonymous reviewers of this article for their insightful advice.

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In *Wicked, Incomplete, and Uncertain*, Jason Swarts examines the changing role of technical communication in addressing user problems that are becoming more specialized and situated within use cases that users themselves do not readily understand. These emergent and real-time problems have led to the rise of online forums and communities, which this book studies in depth. In particular, Swarts studies four community forums for software technology products—Microsoft Excel, Adobe InDesign, Gimp, and Mozilla Thunderbird—that are not only commonly used by technical writers, but also popular products with numerous plug-ins and end users across industries. As a technical writer myself, I have used all of these products, and participate in forums for open source and cloud computing products at the enterprise software company that I work at (IBM). This review seeks to synopsize Swarts’s book by reflecting upon how I have or have not used such techniques in my own workplace experience.

From this look at “user support in the wild” and the genre conventions that Swarts identifies, I came to understand that the products I write and the skills I need are also shifting into more rhetorical stewardship of technical content resources, not just writing manuals, reviewing content, or other more traditional, one-way communication products. Indeed, Swarts (2018) identifies three rhetorical challenges that the book attempts to address: “wicked and tame problems, the decentering of expertise, and help as a social act,” which emerge from “how knowledge creation is redistributed” in today’s business and technological landscape (p. 30). Such problems are “wicked,” or shifting and undefinable (in contrast to “tame,” or clear and solvable problems) and reflect the situations that technical writers, engineers, and users alike increasingly find themselves in.

I must confess that whenever I hear words like “knowledge creation is redistributed,” my initial reaction is unease, because such terms seem to go hand-in-hand with organizational restructuring and other strategic initiatives that could make my job and thousands of others across the industry obsolete. However, I found Swarts’s book timely, relevant, and useful to the challenges that I come across in my day-to-day job, and an invitation to embrace the change by recognizing that writers have many skills that are critical to the shifting landscape. I apply the takeaways not so much in question-and-answer style forums that the study describes, but instead with conversations and more direct interactions with our product’s users. These conversations are increasingly mediated through technologies like instant messaging in group chat apps such as Slack or Microsoft Teams, or even with artificial intelligence (AI)-enhanced chatbots, as opposed to a forum. If there is a weakness of the book, I believe it lies in the fact that parts of the software industry that the book focuses on seem to be moving away from open forums and more towards these closed forums or personalized interactions, which might present their own challenges in surfacing back the information to the broader community.

Swarts (2018) begins by showing how technical communication emerged to accommodate technologies to the situated use cases of people, initially through text but increasingly through other media (p. 3). While still text-based, forums offer the opportunity for dialogue amongst developers, writers, users, and anyone else with internet access. One of the common issues writers face is that no one reads the manual. Yet people still need content to learn and use technology. Another issue is that technical communication usually describes how the technology begins in a prerequisite state, moves through interim states, and finally results in the desired state (Swarts, 2018, p. 18), similar to traditional task-based documentation that outlines prerequisite steps, tasks, and postrequisite steps. Increasingly, however, users combine technologies with other ones,
and the resulting combination can make it “wicked,” or difficult for the users and experts to know what state they are in, which affects how well they can use the documentation.

Forums arose as a convenient way for users to ask help from more experienced users and even the creators of a product. With forums, users can articulate their own problems instead of fitting them into a pre-written FAQ or topic, and also respond back to people, asking them for more information to help collectively troubleshoot a problem. Users tend to prefer this style of interaction, because talking is easier than reading. I have also found that triaging user questions in threads not only helps me identify real issues to improve the documentation that I write, but also helps me build relationships with the development team, which appreciates me proactively reducing support tickets and also funneling back select feedback to them on product usage.

Because forums are problem-based, they have their own unique style and genres of interaction. Building off Carolyn Miller who wrote of “genre as social action” in 1984, Swarts posits genre as a helpful way to look at the social nature and structure that forum interactions tend to take, and the rhetorical actions that are effective in moving the dialog forward towards a resolution. In particular, Swarts (2018) defines four types of genres: work arounds, work throughs, best practices, and diagnoses (pp. 101–102). Then, using verbal data analysis, he traces the rhetorical moves that each genre typically consists of, such as a work around consisting of identifying the actors that contribute to the issue (p. 103); narrating experience of previous user success in resolving the issue (p. 106); verifying and evaluating a solution (p. 107); and identifying impediments to the solution and causes of the failure (p. 109). I was curious whether every interaction follows these genres, or whether there might be more genres out there. In my own experience, user interactions are so brief that I do not think about the genre. However, the power of genre might be precisely that, that we do not think about it, we just act within it. As such, the explicit study of genres and rhetorical moves could be a helpful teaching tool or classroom exercise for learners to “templatize” how to conduct user conversations and think about problems, as well as an opportunity to roleplay with subject matter experts.

Although the required skills and products might change, Swarts argues writers are well-positioned to help users solve wicked problems in forums. Even though forums often invite non-writers to “write the doc,” forums actually extend the work that writers have to do, not replace them. Thinking of my peers at work, I wonder how writers will embrace these new responsibilities. I know people who relish the chance to participate, and others who reject it because of the additional responsibilities and devaluation of their editorial expertise. Editorial expertise, at least in my workplace, is linked to accessibility and internationalization concerns, because unless the source content is well-edited, it is difficult to translate. We can only do so much as individual writers, and if these increasing responsibilities are not met with increasing resources, other areas might suffer. In general, the book does not address how (or whether) forums are made accessible or translated. In my experience, forums generally are primarily English-based resources. I also have not tried to use a screen-reader on a tool like Slack. Further research might involve ways to extend the conversations that happen in forums to broader audiences in more accessible ways.

Similarly, some of the skills that writers are encouraged to adopt are familiar in a classroom, whereas others involve bringing in knowledge from allied disciplines. In particular, Swarts (2018) suggests that writers focus on the following skills (pp. 138–149):

- Negotiating workflows and managing projects
- Interpreting and solving problems
- Facilitating interpersonal communication amongst community members
- Structuring information to develop community knowledge
- Encouraging good habits and good character
- Shaping user contributions into genre forms on the forums
- Articulating and preserving knowledge

I wonder, however, if the challenge of wicked problems might also push the field of technical communication towards technology-heavy framework issues, such as search engine optimization (SEO) for increasing the findability of content, or node.js and other web programming to enhance an online website with progressive disclosure features that might not even exist today.

In summary, although the title of Wicked, Incomplete, and Uncertain problems tempts one to think that the answer is more expertise for more answers, writers actually do not need to be experts to solve wicked problems. Instead, writers can help by being experts in making knowledge that scaffolds learning so that users can do more with the product. The primary strength of the book lies in the tools it gives its readers to think about the nature of our problems. Sometimes such thinking might result in a quick answer on a user forum, but other times it might be more systemic, such as identifying areas to automate a support ticketing process. Instead of throwing out a question in the hopes of a quick and easy answer (what often motivates forum posts), we have an opportunity as writers to be the people who step back and look at problems collectively, holistically, and humanely, and facilitate the work to meaningfully address these problems.

ABOUT THE AUTHOR

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Getto, Labriola, and Ruszkiewicz’s edited collection, *Content Strategy in Technical Communication*, is an important addition to the field of technical communication, and important as one of the only collections to address best practices in content strategy while also connecting those ideas to pedagogies for teaching. In focusing specifically on content strategy, Getto, Labriola, and Ruszkiewicz note that “content strategists often work within a wide variety of organizations and must respond to an even broader array of situations, challenges, and audience needs” (p. 7). To meet this large array of needs, the chapters in the book argue that pedagogies must integrate content strategy ideas to support student exploration of content strategy work. Connecting content strategy theories and best practices with pedagogies will support more theory development on content strategy, and will provide a better sense of classroom best practices that help learners assess the effectiveness of content, regularly. To accomplish this, the editors divide the book into two parts: Content Strategy Best Practices (chapters 2 through 6) and Content Strategy Pedagogies (chapters 7 through 10).

In Chapter 1, Getto, Labriola, and Ruszkiewicz discuss the recent history of content strategy, connecting to Halvorson and Rach’s (2012) fundamental work *Content Strategy for the Web*, and recent work within the Technical Communication Body of Knowledge (TCBOK) project. This brief overview builds the connections between the practices of content strategy and classroom practices, pointing out that learners can engage with content, audiences, content goals, content audits, audience analysis, and other key elements of content strategy to strategize content. They note the importance of attention to strategizing, the need to connect students with the complex and situated emerging definitions of content strategy, the emerging understanding of content strategy work, and the steps necessary to strategizing.

Section 1 introduces readers to best practices in content strategy, authoring and publishing reusable content. In Chapter 2, Getto develops a heuristic to help learners, educators, researchers and practitioners understand and develop content strategy best practices. As an emerging field that also relies heavily on situated practices and understandings within companies, developing global best practices has been difficult to systematize. In offering a heuristic approach, Getto aims to bridge the gap between practitioner conversations of best practices and academic conversations of best practices. As an emerging field that also relies heavily on situated practices and understandings within companies, developing global best practices has been difficult to systematize. In offering a heuristic approach, Getto aims to bridge the gap between practitioner conversations of best practices and academic conversations of best practices. Albers, in Chapter 3, describes content strategy work within complex information environments, including models for helping readers situate the work of content strategy within these complex environments. Focusing specifically on the global context of content, Flanagan explores the editor’s role in editing global content for reuse in Chapter 4. All three chapters focus on content strategy from a back-end user perspective, situating their discussions primarily from the perspectives of content creators, content strategists, companies creating content, researchers studying content creation, and the connections to classrooms.

Shifting the perspective slightly, while further focusing on best practices, Chapters 5 and 6 have an end-user perspective. In Chapter 5, Hovde builds on content strategy best practices from a perspective of user experience and assessing usability. This focus sheds light on under discussed elements of content strategy that can yield important learning and conversation surrounding content management and content strategy systems. In Chapter 6 Duin, Armfield, and Pedersen explore the difficulties of content strategy within technologies using augmented reality. The authors point to yet another complex situation requiring content strategy theorizing and provide a heuristic for human-centered content. Chapters throughout Section 1 explore complex elements of content strategy and provide usable strategies, checklists, and heuristics that

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can support research, teaching, assignment design, and further conversations about content strategy.

Section 2 moves the focus from content strategy best practices to content strategy pedagogies. While authors offer suggestions for classroom practices in Chapters 2 through 6, the pedagogical connection is not the primary focus. Howard, in Chapter 7, uses a case study of teaching a content strategy course to offer best practices for teaching content strategy. In Chapter 8, Borgman applies content strategy to online course management. Borgman argues that content strategy can help instructors maintain online/digital course content in learning management systems, which can help instructors build meaning student user experiences. In Chapter 9, Steiner describes a semester long client service project to explore teaching content strategy at the undergraduate level. In Chapter 10, Behling and Bookman connect content strategy to branding and social media. They also explore how content strategy pedagogy offers best practices for connecting students to the real audience needs across social media platforms, to connect students with the situations surrounding their own content creation.

Chapters in Section 2 not only connect content strategy to pedagogy, they also offer recommendations for adapting and adopting their ideas into various classrooms (content writing, content strategy, technical communication, and more). While chapters like Steiner’s focus on a semester-long content strategy course, the recommendations offered from her case study reflection can be adapted to classrooms that may only include smaller content strategy units. Importantly, some of these chapters offer reflections on classrooms with English majors learning content strategy as part of their degree, while others explore content strategy practices and their impact on general education writing courses that enroll a very different student population. This section recognizes the varied situational and audience-based needs of content strategy as a strength in drawing connections between content strategy theories and pedagogical practices. These applications of content strategy to a variety of classroom possibilities ensures readers find themselves within these classroom examples.

Content Strategy in Technical Communication is useful—and overwhelming. As an emerging field, content strategy carries a uniform meaning throughout the book with producing, publishing, and assessing reusable content within a situation to meet audience needs. But the book also offers 10 chapters with various theories and methods of approaching a moving understanding of content strategy, with various ways of connecting the ideas to classroom pedagogies. Circling back to the initial discussion on the work of content strategists, specifically the array of situations where content strategists work and the need for situational application. The breadth of conversations included within this book models the breadth of work in content strategy. Instructors exploring these ideas are encouraged to consider their local situations, industry connections, and student needs as they read through best practices and pedagogical integration. Instructors interested in developing new content strategy focused courses may find the plethora of conversation overwhelming. Instructors refining content strategy units or courses will find pedagogical practices, assignment ideas, and theoretical discussions to support their course design.

REFERENCES