

Technical COMMUNICATION

VOLUME 67, NUMBER 2

May 2020

ISSN 0049-3155

MAY 2020

Journal of the Society for Technical Communication

ARTICLES

APPLIED RESEARCH

- 8** A Study of the Websites of the 42 Double First-class Chinese Universities: How Does Confucianism Influence the Content on Chinese University Websites?

By Daniel Ding

APPLIED RESEARCH

- 29** Inform or Persuade? An Analysis of Technical Communication Textbooks

By Regan Joswiak and Mike Duncan

APPLIED RESEARCH

- 42** The Pedagogical Opportunities of Technical Standards: Learning from the Electronic Product Code

By Jordan Frith

APPLIED RESEARCH

- 54** Recursive Participatory Mentoring: A New Model for Mentoring Women in the Technical Communication Workplace

By Lisa Melonçon and Liza Potts

APPLIED RESEARCH

- 68** Audio Description: Making Useful Maps for Blind and Visually Impaired People

By Megan Conway, Brett Oppegaard, and Tuyet Hayes



DEPARTMENTS

- 1** EDITORIAL
Mentors and Muses
By Sam Dragga
- 7** ON THE COVER
- 86** BOOK REVIEWS
Jackie Damrau, Editor
- ONLINE ONLY**
TECHCOMM.STC.ORG
- E1** RECENT & RELEVANT
Sean Herring, Editor

Audio Description: Making Useful Maps for Blind and Visually Impaired People

By Megan Conway, Brett Oppegaard, and Tuyet Hayes

ABSTRACT

Purpose: Technical communicators concerned with such issues as media accessibility, disability rights, and universal design could explore fertile scholarly ground by investigating Audio Description more through applied research methods. This article illustrates such potential through the explication of a transmodal-translation process conducted on National Park Service brochures, including interpretation and transformation of their maps into acoustic forms.

Method: Our mixed-methods approach included feedback from diverse blind, visually impaired, and sighted stakeholders, including administrators, media designers, and representative park-site users. These insights were then tested through field work and complemented by multiple interviews and focus groups. During this process, we developed digital tools—including open-source software and free mobile apps—for iterative testing and sharing of ideas.

Results: Besides generating thematic and diverse insights about this topic, our study also established, developed, and refined a set of best-practices guidelines based on research in the field, informed by gathered empirical evidence. These guidelines are intended to support subject-matter experts at public attractions, regardless of discipline, in the creation of better, more accessible maps through Audio Description.

Conclusion: How could a person possibly transform a complex, fully visual, and printed-on-paper map into useful acoustic media for blind and visually impaired visitors? After consulting the scattered, related literature, we oriented our efforts toward the multi-faceted technical communication practice of localization. We then dedicated our project resources to real-world interventions through both the application and the development of audio-description strategies and digital-media-delivery systems as a practical and universal approach to these related translation and localization problems.

Keywords: maps, audio description, blindness and visual impairment, mobile apps, best practices guidelines

Practitioner's Takeaway:

- Through Audio Description, and with proper tools, a subject-matter expert could adequately translate static media—even a visual artifact as complicated as a map—for blind and visually impaired people in efficient and effective ways.
- The transmodal-translation and localization process we created generated a set of foundational guidelines that lead a describer through field-tested steps and provided meaningful examples of description as models.
- This audio-description process revealed the critical importance of: 1) Identifying and maintaining the artifact's purpose, 2) Providing an initial short description for information navigation, and 3) Elaborating, with a more-detailed description of the artifact.

INTRODUCTION

We asked various stakeholders—administrators, media designers, and representative users—for advice about best ways to audio describe a map, and many—including those without sight—responded with a puzzled look and a retort like this: Why would a blind person need, or even use, a map? Besides societal, cultural, and legal arguments for making such media inclusive, which we will address, this study also deconstructs and challenges the pervasive perception that some visual media, such as maps, are irrelevant or even useless to people with visual impairment or blindness. Our applied research, in turn, opens several fertile paths for technical communicators to explore related constructs. Transmodal translation has become the phrase of choice for scholars studying such semiotic movement across modes as an external, material practice (Newfield, 2014). Our approach to Audio Description envisions that conversion as a transmodal-translation process that transforms information from purely visual to purely acoustic discourse. In addition, through our UniDescription Project, www.unidescription.org, we freely share open-source Web tools and mobile apps in support of this type of novel inquiry.

As content of a media channel—whether as the primary mode of communication or in a supplementary role—Audio Description promotes information accessibility and aligns with technical-communication ideals of universal design, in which information, products, and environments are usable by all people—regardless of age, ability, or status in life—without the need for adaptation (Ostroff, 2011). For their part, audio describers look at visual media, such as maps, and transform the essence of this information explicitly made for eyes into content designed and tuned specifically for the ears. If properly integrated and interwoven into an environment's media design, Audio Description could seamlessly deepen and enrich access to those with visual impairment but also assist those who are print dyslexic and, even more broadly, those who simply appreciate information experienced audibly. The many, widely practical uses of open and closed captioning—such as captioned video displays in noisy public environments, including many restaurants and airports—provide a clear model of how universal design practices can benefit more than just primary and strictly intended audiences. Technical communicators, though,

have yet to thoroughly investigate Audio Description in depth, which creates a prime opening for a subfield of scholarly inquiry to emerge.

Along this vein, during the past three-plus years, we have conducted multiple rounds of investigation, analysis, and application of our findings in contexts of professional training and workshops. We also have guided efforts in the wilds of various audio-description contexts, including production and in-situ experimentation, collaborating with subject matter experts at more than 50 National Park Service sites throughout the United States. These collaborators were typically staff members deeply trained in the cultural, environmental, and historical importance of their sites and in various interpretative techniques designed to communicate that importance to the public. But they also were people mostly new to Audio Description and the ideas around it.

During our Hackathon-inspired sessions, which we called “Descriptionathons,” these subject matter experts—working at the parks and creating Audio Description of their park brochures—consistently and frequently stated that maps were the most complicated and frustrating of all of the static visual media we collaboratively discussed and described (including photographs, illustrations, collages, timelines, and infographics). So we started there, at the most-difficult puzzle to solve. To put the related research question plainly, we wanted to know: In what ways can technical communicators be productively and helpfully involved in the conversion of static media, such as maps, into accessible media for those who cannot see or cannot see well?

To illustrate, we begin with one of our key findings, part of an affinity cluster of qualitative comments about the core concerns here, which we will return to later in the paper. In this first case, after completing description of all of the various components on his particular park's brochure, a sighted ranger in Alaska's Denali National Park and Preserve summed up the situation this way during a post-mortem interview: “You could spend a lifetime trying to figure out (how to describe) the map.... What's the purpose of the map?”

For the sighted, visual maps efficiently depict distinct features, such as landmarks, as well as structural information, such as distance between places, and even the relative directions of those features compared to others, which all can be assessed with a glance (Stock et al., 1995). For blind and visually

AUDIO DESCRIPTION

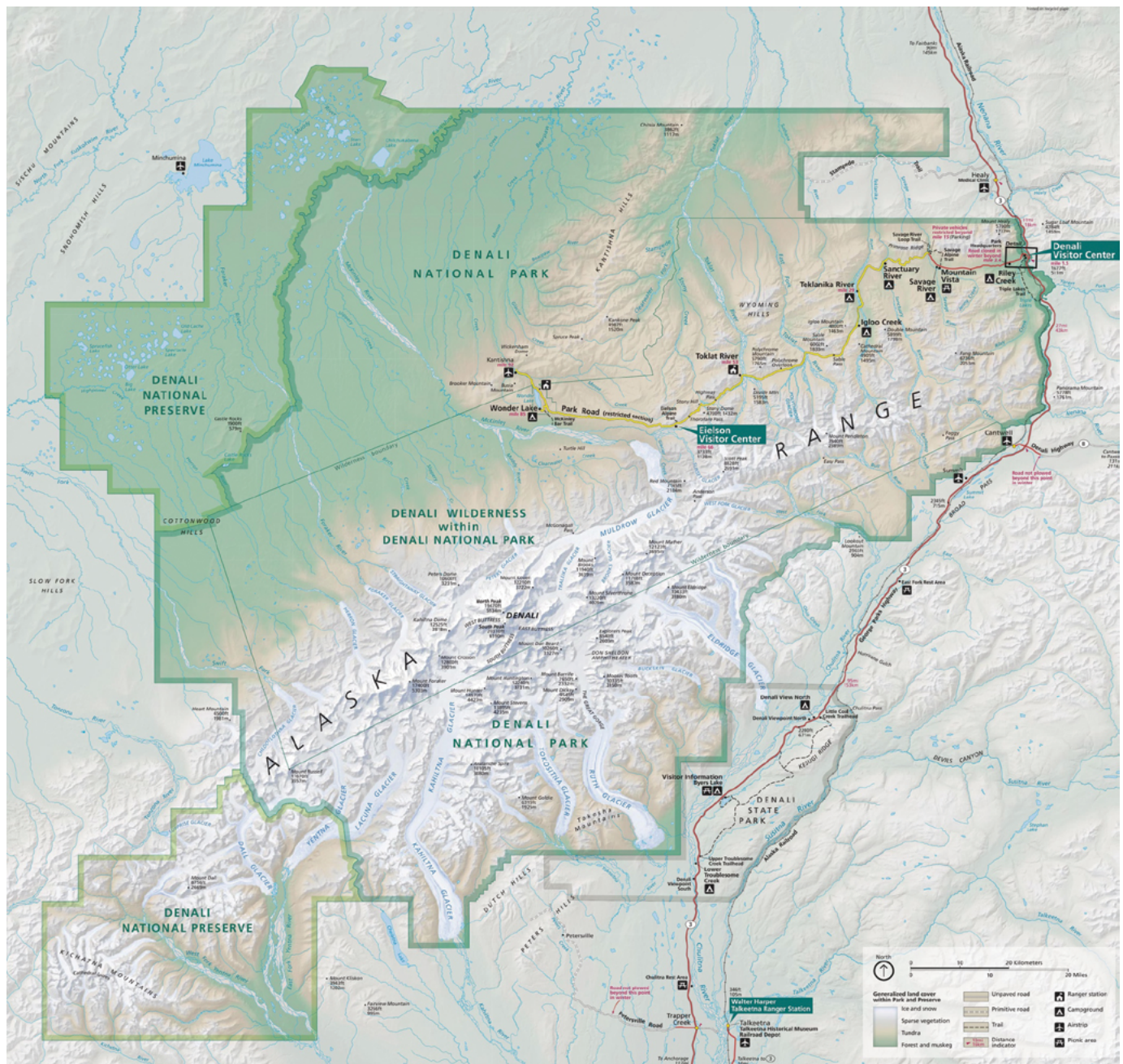


Figure 1. Denali map on the Denali National Park and Preserve UniGrid brochure

impaired users, though, map exploration generally has three foundational purposes: 1) For orientation and movement, 2) For exploration of locations of interest, and, 3) For learning about a place (Buzzi et al., 2011). How those purposes manifest, interact, and overlap generally remain a mystery in practice, though, due to scholarly and industry inattention to this topic. Therefore, in this paper, we have undertaken

an exploratory mixed-methods approach—triangulating data gleaned through semi-structured interviews, focus groups, and field work—to establish the importance of this topic for technical communicators and then to develop topics of interest around this research area, which, in turn, we think, will help to establish best practices within it. After presenting a foundational literature review to acquaint technical-communication

audiences to key aspects of Audio Description and the context of our findings, we also offer here an initial set of best-practices guidelines to improve Audio Description of maps at this stage but also to serve as an example of how this type of applied research can be fruitful, focused on a research question even more finely expressed as: In what ways can a purely visual map be efficiently and effectively audio-described?

AUDIO DESCRIPTION AS A TECHNICAL-COMMUNICATION ISSUE

Three of the major technical-communication journals—*Technical Communication* (TC), *Technical Communication Quarterly* (TCQ), and *IEEE Transactions in Professional Communication* (IEEE TPC) —have published at least one special issue about “accessibility” since the mid-1990s, and they have published various other articles on related topics as well (Oswal, 2013). Meloncon (2013) established the importance of accessibility matters in the field of technical communication with her edited collection “Rhetorical AccessAbility: At the Intersection of Technical Communication and Disability Studies,” offering essays that address the intersection of disability, rhetoric, design, and accessibility (Reynolds-Dyk, 2014). Audio Description, as a subfield in this area, though, rarely gets mentioned in technical communication works and has yet to get much dedicated review and analysis. Within what arguably gets classified as the five highest-impact journals in technical communication—*TC*, *TCQ*, *IEEE TPC*, *Journal of Business and Technical Communication*, and *Journal of Technical Writing and Communication* (Lam & Boettger, 2017) —we could not locate via the OneSearch Web tool any articles or abstracts that included the term “Audio Description,” a void verified by hand in this *Technical Communication* journal through an article-by-article search of its issues over the past five years. Of the 514 English-language and peer-reviewed articles located through the search term “Audio Description” via OneSearch, two journals (*Perspectives: Studies in Translatology* and *British Journal of Visual Impairment*) accounted for about 20 percent of all published material, with the rest scattered among a variety of mostly interdisciplinary journals.

We also searched for alternative terms, such as “visual description,” and looked across disciplines to

try to locate a mass of academics magnetized to this particular area of study, finding no related community of scholars. We did identify nine scholarly books focused upon Audio Description but with no clear clustering in any particular field, and none of those books specifically aimed at a technical communication audience.

Technical communication, therefore, has a rich opportunity to both advance empirical understandings of Audio Description and to stake a significant disciplinary claim to this particular scholarly area, as it has already done to some extent with captioning studies for people who are deaf or hard of hearing. In such an interdisciplinary environment, disagreement on terms could stymie scholars. Therefore, among a few similar labels circulating in this community, we chose to consistently use the terms “audio describing” (or “audio described”) to encompass the complex transmodal-translation process of remediating visual media into acoustic media and then localizing content for audiences of blind and visually impaired people. Such interventions—integrating translation, localization, and design—are common in technical communication research but not commonly applied as Audio Description to date (Getto & Sun, 2017; Gonzales & Turner, 2017; Gonzales & Zantjer, 2015; Meloncon, 2013; Shivers-McNair, 2017). We also chose to describe these remediated end products in acoustic form as “Audio Description,” with first-letter caps, to signal both the unity forming in the field around that label and the distinguishing features of its end product. In these labeling situations—rather than using alternatives also circulating in related academic discourse, such as video description, visual description, descriptive video, etc.—our choice for terms aligned with common use by various media-accessibility organizations around the world, including the American Council of the Blind, the U.S. National Federation of the Blind, Media Access Australia, the Audio Description Association of Scotland, and the U.K.’s Royal National Institute of Blind People.

MAPS AS A FUNDAMENTAL HUMAN CONSTRUCT

In establishing the importance and boundaries of a place, maps are no trivial aesthetic flourish. They have been carefully designed and applied to various contexts for

AUDIO DESCRIPTION

thousands of years for many critical societal purposes. They have been used as conceptual tools, for example, to present diverse and overlapping paradigms of the human and physical environment, including visible and non-visible geographical features but also intangible symbolic frameworks. Those include environmental processes (e.g., weather patterns over time), demographic relationships (e.g., wealth distribution in a community), and worldviews (e.g., clusterings of political affiliations in a region) that help to shape the ways in which we think about places (Montello et al., 2018). As technical communication artifacts—malleable in purpose—maps can illustrate characteristics of a place that are physical, political, and/or topographical, showing representations of phenomena as diverse as climate, natural resources, and roads.

Maps complement billboards, street signs, landmarks, and other types of location-based visual cues to give sighted people a continual sense of their surroundings as well as constant semiotic feedback about a place, beyond what any person could directly understand through unmediated and unextended sensory data, as if walking through a new place alone, disoriented, and blindfolded. As a primal orienting force, maps traditionally privilege the eyes and have been designed for purely visual use, with subtle visible cues—such as the thickness of a line, colors, shading, etc.—conveying nuanced layers of meaning strictly determined by a sense of sight. The U.S. National Park Service, which is the caretaker of many of the country's most precious places, prominently features maps in its paper brochures that are handed to visitors as they arrive, as a universal way to welcome and orient people to each important public resource. Such broad outreach with silent and visual brochures, though, and often without equivalent alternatives, could also come across as exclusory.

Built and heavily mediated environments—as National Park Service sites generally are—can be disorienting, difficult to interpret, and even intimidating for people (especially those with visual impairments), particularly when they lack a mental map of the surroundings and are provided little or no sensory data to generate such a map (Schinazi et al., 2016). An appropriately mediated representation of a place, such as a map, is essential for people to have the ability to move about independently, to localize places that cannot be directly perceived because they are

hidden or remote, and to plan trajectories on the basis of this knowledge, which is of great importance and concern in common human existence (Thinus-Blanc & Gaunet, 1997). Such matters also are of primary concern in the field of technical communication.

SOCIETAL, CULTURAL, AND LEGAL ARGUMENTS FOR ACCESSIBLE MAPS

The U.S. National Park Service (NPS) attracts about 330 million visitors a year, about the same number of people who live in the United States. For privacy reasons, it does not track patrons by discrete demographics, such as visual impairment or blindness (Rott, 2016; NPS, 2018). Of those visitors, though, nearly 80 percent report looking at the site brochure, the number one most-common activity at any NPS site, tied with viewing outdoor exhibits (National Park Service, 2011, p. 16).

The World Health Organization, meanwhile, estimates 253 million people around the globe are visually impaired or blind, 81 percent of which are 50 or older. That age group is a significant segment of NPS visitors, often parents or grandparents that visit NPS sites, frequently with their children or grandchildren, perpetuating both interest and engagement in public places (Bergeron & Redlitz, 2015; National Park Service, 2016). As just one example of the many usability constraints inherent to these sites, transportation to national parks—often located far outside urban areas—can be challenging to coordinate for people with visual impairment or blindness. Dedicated programs and services—if they even exist at a site—can be difficult to discover or distinguish from other visitor services. Marketing and outreach from parks about such programming can be spotty or nonexistent. So few involved in this environment find it surprising that NPS staff members consistently report as rare any visits by people who are easy to distinguish as blind or visually impaired, such as those carrying white canes or traveling with service dogs. Without compelling Audio Description, and other related services, to support their visits to the sites, several members of the community stated in our discussions, why would they?

Because of the growth and change in age structure of the world population, with people throughout the planet living longer, blindness and visual impairment

are accelerating on a global scale leading to projections of both blindness and visual impairment tripling by 2050 (Bourne et al., 2017). Those within the second (moderate), third (severe), and fourth (blindness) levels on WHO's International Classifications of Diseases (2018) do not have equivalent access to many levels of society that others might take for granted, such as constant location orientation through checks of street signs, wayfinding via prominent visual landmarks, and common visual scanning techniques for quickly interpreting maps. Hence, a clear need for such information exists and is growing. Audio Description, in turn, could help reconnect people to society, places, and communities.

A sizeable audience of consumers of such content, including at NPS sites, therefore, appears in at least a latent form. In the United States, for example, depending on how and when the vision-loss community was measured, the number of people who are visually impaired or blind ranges from roughly 7.3 million (National Federation of the Blind, 2015) to 25.5 million (American Foundation for the Blind, 2018). Impairment, meanwhile, affects not only the diagnosed individual, but it also can affect access to public discourse and activities for close families, friends, colleagues, etc., operating in tandem with connected companions who are visually impaired or blind.

Lastly, at the most fundamental level of legal compliance, Audio Description addresses U.S. federal law mandates, such as those within Sections 504 and 508 of the Rehabilitation Act of 1973, which require equivalent access for persons with disabilities to public facilities, learning materials, and other types of information resources. The NPS has extended this requirement into a bureau-wide philosophical mantra of an "All in!" campaign, intended to improve nationwide accessibility to its resources by 2020, among other related initiatives. Our research project, in conjunction with the NPS—also in collaboration with the American Council of the Blind, and external funders, such as Google—aims for broad and long-term solutions to these accessibility issues through the development of digital platforms, tools, and high-quality content.

METHODS

Through our literature review, we scanned the identified articles and books, looking for clearly defined

best-practices guidelines and mentions of maps. We then used those findings, as paltry as they were, to create a list of 14 open-ended questions that we thought deserved deeper investigation on the topic of high-quality map Audio Description. Those initial questions (see Table 1) ranged from requesting broad guidance, such as "Where should we put our efforts?" to specific curiosities, such as, "Is it helpful to include the map legend in the description?"

We used this list as a framework for three types of feedback environments: 1) Semi-structured interviews with stakeholders in-person, via phone, and by email; 2) Semi-structured interviews with stakeholders in small groups in-person, in which they took turns answering questions but generally did not talk among themselves; and 3) Focus groups of nine or fewer stakeholders, during which dynamic interchanges between participants were encouraged and prompted by a research-team moderator. These data-gathering processes followed standard research procedures and protocols for interviews and focus groups, approved by our university's Institutional Review Board, including the following frameworks: Sessions were audio recorded (some were also video recorded), with transcripts created for each. Handwritten notes also were taken.

Our work was experiential in orientation and essentialist in theoretics, assuming both a knowable world and intent on "giving voice" to these diverse experiences related to map Audio Description and inherent meanings within that world, as conceptualized by Braun and Clarke (2012, p. 59). Using Glaser et al.'s (1968) constant-comparative mode of grounded theory, as exploratory and reflective in approach, the first two authors of this paper reviewed the transcripts and notes independently and used a combination of an open and closed coding system of content analysis, described in more detail below, to mark discourse related to best practices for audio describing maps when general consensus about the craft was expressed. We then compared and refined those codes periodically in search of theoretical common ground. Common practice frameworks in such content analysis work, as outlined and identified by Krippendorff (2019) was also used throughout, and that particular text was consulted as a reference guide when questions about methodological processes arose. As another illustration of the approach, we also marked elements related to best practices for audio-describing maps that indicated factors where

AUDIO DESCRIPTION

Table 1. Initial set of interview and focus group questions

1. Overview question: How should audio describers handle maps?
2. Overview question: Where should we put our efforts, in relation to developing better map description?
3. How long should the Audio Description of a map be?
4. Should there be a short description and a long description?
5. What is the critical information that needs to be at the forefront (i.e. amenities, size of the park, purpose of map) ?
6. Is it helpful to include separate, pertinent info that gives users an overview of the story that is told in the map?
7. How important is identifying the amenities in terms of orientation?
8. Is it best to orientate people directionally (i.e. east, west) or to what you are literally looking at?
9. Should we divide out the various components of the map (i.e. amenities, trails, cultural references), or organize the description in terms of what the viewer is literally seeing in various areas of the map?
10. Is it helpful to include the map legend?
11. How important is it to know exactly where such things as trails and campgrounds are, and what is the best way to describe where they are?
12. How helpful is it to make an analogy to something else (i.e. looks like a bird)?
13. How important are park boundaries and is it helpful to describe the size and shape of the park?
14. Are there components of a map that it is simply not helpful to describe?

Table 2. Complementary interview questions, evaluation of app and products

1. What is your overall impression of the UniD App?
2. Was the structure of the material logical and easy to use?
3. How would you compare the UniD app to others you have used?
4. Were the instructions for use easy to understand and apply?
5. Which features did you like best?
6. Which features need improvement?
7. Were the descriptions of images adequate, too short, or too long? Give an example.
8. Were the descriptions of the map adequate, too short, or too long? Give an example.
9. How was the organization of the descriptions?
10. Were there components of the descriptions that were confusing or not helpful?

personal choice (or other factors) seemed to drive responses and elicit different responses from different participants, guiding us to key areas of inquiry.

We started this process with a deductive- and closed-coding system to determine what content was related to audio describing maps (coded as “related” or not). Then, that culled data (as related to the research question) was reexamined via an inductive- and open-coding system to tease out theoretical themes that spoke to this inquiry’s primary objective, to learn more from the stakeholders about what current perspectives on this topic exist. We brought together these ideas through our perceptions of semantic similarities, clustering and reclustering map-related sections, as we compared our independent findings, until we reached what we considered a robust thought mass (which we describe as an affinity cluster) via those linked associations (Bazeley, 2017; Macia, 2015).

Once we had a corpus of thoughts about this subject separated into these affinity clusters, by map matters, we merged that data into various related semantic clusters, until we felt we had a good fit, as a way to consolidate clusters of content and nuance that both filtered extraneous ideas and also provided insightful and interesting juxtaposed meanings when combined with other comments. As Glaser et al. (1968) stress in describing this process, other researchers might have put these pieces together differently in a similarly inclusive manner, so these representative findings should be considered a subjectively interpretive presentation, based on what we considered logically consistent conceptual relationships within themes, as a method of distinguishing trees from the forest (Guest & McLellan, 2003). From this process, these theoretical themes, or affinity clusters, appeared to us and warranted further inquiry.

We used the same list of questions for all feedback contexts during the first year of study, 2015, then expanded the conversations with a second set of questions (see Table 2) during the following years (2016–2018). We conducted a pilot study at three National Park Service sites in March 2016 (in Hawaii, California, and Washington, D.C.), in which park staff described their brochures, including their maps, with no specific guidance or training on this activity, followed by a proof-of-concept activity with eight park sites around the country, in September 2016. This was part of the first official “Descriptathon,” which included some training as well as competitive and collaborative activities designed around gamification techniques. We since have offered a Descriptathon 2 (with 28 parks in February 2017), expanding and refining the processes of Descriptathon 1, and a Descriptathon 3 (with 12 parks in September 2017), with additional Descriptathons after 2018 producing complementary data not included in this study. During Descriptathon 3, and afterward, we systematically have been integrating the Audio Description created by park staff with our ensuing field tests of the created material—providing the park staff with a direct feedback loop from real audience members in real contexts—including conducting basic usability tests.

In total, during the three-plus years of data gathering, we completed interviews with 21 stakeholders with diverse perspectives on this issue. Those interviews took place through four separate small-group sessions, followed by individual phone calls or emails to each member of the group, requesting more information about specific points that were raised by that person, helping to form a thought cluster. In addition to these semi-structured interviews, we also brought together other groups of stakeholders for small focus groups (differentiated from the previous small groups by cross-talk being encouraged among participants). These sessions raised the same basic questions about the Audio Description of maps, and other related topics, only in more dynamic and interactive group settings, allowing for extensive interaction among participants. For a list of these sessions, including dates, places, participants, and protocol, see Table 3.

All of these sessions were moderated by a member of our research team, trained in interviewing and

managing research focus groups. These focus groups typically lasted about an hour (between 30 and 90 minutes), depending on the size of the group and its engagement with the topic. All together, as part of the focus group stage of this data collection, we consulted with 90 people during these dynamic discussion settings, although 21 of those individuals also participated in the interview stage as well, creating a double count for some. Counting stakeholders only once, even if they participated in two feedback sessions, we consulted with a total of 69 individuals directly affected by, or involved with, Audio Description.

Both the interviews and focus groups were generally organized by topics but not confined strictly to discussions about audio describing maps. We also, during the course of the discussions, talked about broad guidelines for Audio Description and audio describing other types of artifacts, including photos, collages, and charts. In all of these sessions, we typically would expand our list of questions and raise the maps issue with an open and conversational volley, such as, “How should audio describers handle maps?” From there, we would engage with the issue through the list of questions in Table 1 and Table 2, dictated by feedback from the sources, and then introduce complexities into the discussions, asking basic follow-up questions about uses for map Audio Description as well as seeking examples and models of exemplars known by participants. These interviews and focus groups all devoted a significant portion of their time to discussing the Audio Description of maps.

FINDINGS

From the feedback we collected and grouped, through the described affinity clustering-and-analysis process, we identified several topics worthy of attention and further consideration, including and illustrated by the following theoretical clusters of descriptive data, given a top label to indicate the core premise of the binding codes that brought them together:

Affinity Cluster A: Audio Description, Especially of Maps, Needs Attention

As referenced in our introduction, many of the interviewees—despite being blind or visually impaired, or working within the professional Audio Description

AUDIO DESCRIPTION

community—were as perplexed and curious about the topic of map Audio Description as we were. For example, a top administrator of a national association serving people who are blind or visually impaired, and who also is blind himself, said:

I haven't ever really used a map, and I'm not going to sit here and say that not many blind people have used a map to navigate, but I don't know that a lot of blind people have used maps. We've been really more reliant on technology (such as GPS, infrared, etc.) to help us navigate.

In other words, maps generally have been perceived as inaccessible and unusable for people who are blind or visually impaired, because they are visually designed but also because they primarily are conceptualized as tools for getting from place to place, when, instead, they actually might have many other purposes, such as providing socio-historical context to a place.

A curator for the Library of Congress, who is blind and for years has specialized in services for people who are blind or visually impaired, acknowledged:

I've never seen a good descriptive of a map before.... For mostly recreational reading material, (describers) just leave (maps) off. They just say maps have been omitted.... I don't think (our National Library Service describers even) describe maps. We tell them not to, because we're not going to pay them to sit around and figure it out.

A sighted consultant with a national association for people who are blind or visually impaired, who also operates an audio-description company and has written a well-circulated book about it, said that describing is:

More art than a science. You can have 20 describers come up with 20 different descriptions. And they're all good. They're all correct. You know, fine. But there also are going to be some people who will come up (with content) that is just not correct. They're not good. They're not quality, and I get concerned about that, because so many people have not experienced description, and if the first experience is with bad description, they're going to turn it off, and we've lost them.

Affinity Cluster B: Audio Describers Need Additional Guidance

This collection of responses illustrates the inherent difficulties of describing a map, especially without robust and broadly accepted guidelines available for reference, with a clear need expressed for more attention to be paid to this topic.

For example, these comments came from the September 2016 Descriptathon, from a sighted park staff member in California:

I had to kind of go painstakingly through (the map) trying to make that description flow as best as I could, which is a little difficult with maps, of course, but try to imagine what it would be like if I was not able to see the map, and imagine you're walking around (the site) or looking down from an airplane.... I tried to cover the major parts of the park, in kind of a linear fashion.

From a sighted park staff member in Alaska:

The biggest hump for me was getting over my fixation on maps as being for people who are driving. The idea, like the voice who, you know, was going to tell you make a left turn here.... It gave me a sense of the other purposes that maps serve, beyond just providing people a navigation tool about how to get from point A to point B, but also that it serves for providing context for visitors about where they are in the world and the landscape forms and geography kind of things, like that, (and) your description can serve them as well.

Since we gave Descriptathon participants our initial guidelines, based on exploratory findings, some of the subject matter experts in this stage expressed that they were not adequate and instead tried to replicate the provided models, indicating a need for even further examples in the guidelines but also a desire for solid touchstones, as a way for a subject matter expert to begin a foreign process and create non-derivative content, such as this comment, from a sighted park staff member in Washington state:

An exceptional description of (another park's map was provided in the training session), so I kind of put that in a Word document and then put another

Megan Conway, Brett Oppegaard, and Tuyet Hayes

Word document next to it and kind of tried to follow that formula a little bit and tried to pull some of that language, but, of course, that's a much more complicated map to describe.

From a sighted park staff member in Hawaii:

"How do we know (what to describe), because there are so many things on it? ... I think that was the hardest part (of the process), which I was working on, and so I kind of looked at the sample that somebody made (in the best-practices guidelines) and that description breaks down the steps, which is totally what I did.

From a sighted park staff member in New York:

I really liked on the (guidelines for the) map where they said, here's adequate; here's good; and here's a really good example. That would have been helpful in all the basic genres that you were showing us.

From a more philosophical and conceptual perspective, a sighted NPS media designer at Harpers Ferry Center said questions exist about the Audio Description of all media forms, but maps have unique complications, adding:

Are you describing the map in the way you would describe a photograph or are you describing the content that the map is intending to convey? If you are describing the content that the map is intending to convey, that's got multiple layers. How do you do it efficiently? Which raises the question of is there content that is exclusively conveyed by the map that is conveyed nowhere else in the brochure? Do you say we're going to describe the content that is exclusive to this map? There are other places in the brochure that you could link them to.

During this stage of research, working with the subject matter experts in real contexts, we also took our guidelines and ideas about audio describing maps to a blind administrator at the Lighthouse for the Blind and Visually Impaired in San Francisco, to receive more feedback, which included this:

Clearly there are corners, if not entire swaths of (Audio Description) that have yet to really be figured out.... I think you lead with the purpose of the map. When you just say the word 'map,' people in their mind, they think of certain things, right? Like when I hear map, I have to remind myself that it might not just be a geographic map, it could be something completely different. So I think that matching up that person's expectations to what the sighted person has probably pretty quickly gleaned by looking at the map already, is important. You know, if I'm there, and I think that I'm going to get an Audio Description of a map that's going to tell me where each trail is, or something like that, and it is in fact a map that's more about historical things, I need to know that right away. So I want to see that more expectations are aligned properly for everyone.

Affinity Cluster C: Boundary Work Wanted and Needed in Audio Description

Maps appeared to be a most mysterious artifact to nearly all stakeholders we included, especially when we asked them for advice about how they could best be audio described. People had ideas about various aspects of such description, such as how long they should be, what they should include, and where they should start. But it was clear that few of our focus group members had spent much time giving the idea deep consideration. They did not have handy examples or well-worn guidelines available to follow. They did not necessarily want prescribed rules, either. So the desire seems to be for some structure but not too much structure, conceptualizing the translation process more as an art than a robotic activity.

An administrator at the Lighthouse for the Blind, who is blind, for example, said:

The really terrible example that I have is textbooks from when I was in college.... They would have people describing diagrams, and they would just jump into this whole description of a whole diagram, and you'd be lost because by the time they described the third concentric circle with lines in it, I didn't know what the point was anymore. So my inclination is start with the (larger) point (of the map) and then let me drill down into the detail.... I always like being able to drill down. If there's

AUDIO DESCRIPTION

a map, and this is a map showing, I don't know, climate change in the different parts of California. And it has the north and the south and the central, or something like that, and then you could pick, you know 'Tell me about northern California. Tell me about southern.' (I like to) have a general description of 'this is what this map is conveying' and then being able to drill down or pick the features of interest.

A Lighthouse for the Blind media designer, who is blind, said:

I think that an Audio Description of a map should probably be more conceptual, in terms of explaining what the map is for, as opposed to describing the details of the map. Because describing the details of a map—in terms of trying to explain all the spatial relationships—could be very difficult, and frankly, to listen to all of that would be rather confusing. As opposed to, if you just say this is a map of the layout of a park, or this is a map showing the history of a certain event. Rather than saying that at 12 o'clock there's this object, and then at 5 inches to the left, there's this object, at 3 o'clock and at 9 o'clock are these other objects, to the right of that a second object. That's very confusing, because it's a linear listening process, so it's kind of like converting a two dimensional object into a one-dimensional description.

One important finding that contributed to our rethinking of our best-practices guidelines was the repeated perspective that if a map is going to be audio described, it needs to be thoroughly described without judgment on the part of describer about what is "important" or "most useful." To address the related issues, involving individual preferences (some users prefer a very short description, others a longer description) arguments were repeatedly made in this stage of data collection that both a short and long description should be made available. Another key finding was that there are important distinctions between the purpose and problems in describing a wayfinding map from other types of maps (such as ecological or historical). While non-wayfinding maps may be described in a similar fashion to a photograph

or an illustration, a wayfinding map is intended to provide information about navigation, which brings another level of complexity to Audio Description, such as how to design the media to encourage independence and agency.

Users discussed at length their desire to have a "map" that will help them navigate independently while they are visiting a park. This finding echoed other findings throughout our research process on maps for visually impaired and blind people. The stakeholders we consulted uniformly dream of being able to navigate the parks without having to be dependent on other people. Independent navigation truly allows for individual choice and the opportunity to be "alone" or to "be a part of" the group.

Many other proximate comments, meanwhile, raised questions about how much of the community's knowledge about this topic really is reverberated among its members versus a foundation in first-hand sensory experience and reflective thought. These comments often were personalized, as in "I like it this way," versus, "I like it that way." But we also became curious about subtle clustering of ideas, among subgroups, and how these proclivities might relate to when in life a person became visually impaired—such as at birth or sometime later in life—and how those different contexts and preferences might be reflected in the content design. In short, we found almost no evidence of empirical testing of many of the field's most foundational ideas.

Affinity Cluster D: Experimentation Desired, Not Heavily Prescriptive Rules

Among his concerns about the further development of Audio Description, a blind assistant director at the Lighthouse for the Blind and Visually Impaired warned of potential attempts at quality controls that could lead to the weaknesses of one-size-fits-all description. Too much prescription, he said, could privilege some viewpoints and create formulaic, uninspired description, rather than embrace the potential Audio Description has for improved artistry and to embody emerging affordances provided by new technologies. He added,

There's no such thing as too long (of a description). I guess that's probably a little bit hyperbolic. I'm sure that there's such a thing as too long. But I just think that one of the things that should be taken advantage of, when you're talking about an audio-described

Megan Conway, Brett Oppegaard, and Tuyet Hayes

map, is that you're not gonna bump up against some wall... You're never gonna run out of room for words. You're never gonna run out of room for audio files. So I don't think (description length) really matters. I don't think that there's such a thing as too long or too short... There should be standards, but I don't know if one of them should be every audio-described map needs to be within this time range. Not wild about that idea.

As far as maps are concerned, this group of field testers consistently expressed that too much information was better than too little information, and that the Yosemite map description (which was based on the initial best-practices guidelines) helped them to understand what was available and where it was generally located, illustrated by this blind female participant's comment:

It was a lot, but it was good. It was more than good for me because it gave an abundance of information, and it kinda guided me through what I wanted to, you know, I could just pick and choose. If there was something in particular that I wanted to look at or read about, I kinda just opened up things that [were] interesting.

A sighted NPS media designer at Harpers Ferry also addressed issues about making a predetermined length of a map description:

People have so many different ways of understanding information, so when you have one option, as we learned in all of our design practice, everybody has trouble with some element of it. So we try to include as many options as possible, for taking in that information. But I'm wary of saying 'short and sweet,' just because then you have people who are like, 'Well I'm a park map buff, and I want to know all of the information. Why would you limit it to this?' Or people who just have better attention spans.

Affinity Cluster E: Audio Description as a Form of Community Outreach

In our tests of guideline-generated Audio Description, with representative users of such information, several

blind or visually impaired participants said that listening to the map description made them want to visit the park and become more engaged in both that particular place and other attractions throughout America. They were generally impressed by the efforts of these subject matter experts within the National Park Service, who created such detailed descriptions, and, in turn, they wanted to give the descriptions and parks more attention, as a payback of sorts for them being so thoughtful and considerate about their information-gathering needs.

For example, in Yosemite in November 2017, one female blind participant remarked:

You're actually standing in the middle of it, where you could smell it, you could feel it, you know, so it really gives you that visual sensation of everything around you. So obviously we haven't had that before. So I think that's definitely a big positive.

In July 2018, a blind female participant at Cape Cod National Seashore remarked:

It is very important for people to know that it can be very lonely, being alone and not being able to see. All of a sudden, though, through these descriptions, we can see.

A blind male participant, in the same focus group, added,

A lot of us (who can't see), are starving for attention. We want to get out. To do things like this.

Another blind female participant in that focus group then added,

Through (this app), I feel like (my park) is really making an effort to reach out to me.

As more evidence of pent-up demand for this type of accessible experience, the ACB Facebook post about the Yosemite field work shattered the ACB social media channel's record for views, as the first to surpass 100,000 views, setting a new benchmark at about 125,000 views.

In summary, through our mixed-methods approach, we have identified five major paths of

AUDIO DESCRIPTION

further scholarly inquiry that would be beneficial to the betterment of Audio Description, particularly of maps. Those are: A). Audio Description, especially in illuminating cartographic forms, needs much more attention. At this point, very little research has been or is being done in this area. More is needed, related to an array of research questions emerging about this topic. B). Audio describers need additional guidance, meaning that not only does more research need to be done, more of this research needs to be designed to be efficiently shared with stakeholders. C). Among these fertile areas, boundary work is wanted and needed in Audio Description. Few boundaries, such as defining key terms and theoretical frameworks, have been established around this subfield, making it difficult to advance research in a collective manner. D). Experimentation is desired. Heavily prescriptive rules are not desired, meaning that much of what is thought about Audio Description today is anecdotal or cultural, not scientifically tested. E). Audio Description is a form of community outreach and can be developed as a binding tissue that brings together people who are blind and visually impaired for shared activities and interpretations. It is not just a description. It is the way in which we see the world.

DISCUSSION

We consider this work as just a beginning to a much bigger and broader discussion in the field of technical communication about the intersection of design and media accessibility with disability studies and, in particular, Audio Description. Despite the breadth and depth of the data generated and explored here—as highlighted clusters—and the progress that represents, this research effort created many questions about the process and possibilities for best practices related to audio describing maps, especially when considering the development of the current guidelines and remaining unaddressed concerns. These fundamental issues under consideration range from foundational concerns, as in, “Do blind and visually impaired people really need (or want) Audio Description of a map?” to particulars of scope (such as, “Does everything on a map need to be audio described, or just the most important elements? And what are those most important elements?”) and even genre matters such as, “In what ways is audio describing a map similar to audio describing a photograph or a chart?”

These findings emphasize the importance of first identifying the key elements of the map for a shorter

Table 3. Focus groups facilitated during this round of research

Date	Place	Participants	Protocol
November 2015	Harpers Ferry Center, WV	Six (five male, one female); all brochure designers; all sighted	Focus Group; Table 1 questions; in-person meeting
November 2015	Washington, D.C., at three different national-oriented organizations, the National Library for the Blind, the American Council of the Blind, and the Audio Description Project	Three (two male, one female); all high-level administrators; one male was sighted; the other two are blind	Semi-structured interviews; Table 1 questions; in-person meetings
March 2016	Washington Monument, Washington, DC; Hawaii Volcanoes National Park, on the Big Island of Hawaii; and Golden Gate National Recreation Area, in the San Francisco Bay area of California	Five (four male, one female); all park rangers who collaborated on the Audio Description of the monument’s brochure in the pilot study; all sighted	Focus Group; Table 1 and 2 questions; conference call, followed by one-on-one semi-structured interviews via phone

Megan Conway, Brett Oppegaard, and Tuyet Hayes

Table 3 (continued)

September 2016	Throughout the country	Seven (four male, three female); all park rangers who collaborated on the Audio Description of their park brochures in the proof-of-concept phase (Descriptathon 1); all sighted	Focus Group; Table 1 and 2 questions; conference call with the group, followed by one-on-one semi-structured interviews via phone
February 2017	Honolulu, HI	Eight (six female, two male); all members of the Hawaii chapter of the American Council of the Blind; all blind	Focus Group; Table 1 and 2 questions; in-person meeting
August 2017	Lighthouse for the Blind and Visually Impaired in San Francisco, CA	Seven (four female; three male); all members of the Lighthouse's media-design team; two of the males and one of the females were blind	Focus Group; Table 1 and 2 questions; in-person meeting, including two follow-up semi-structured interviews
September 2017	Throughout the country	Seven (four male, three female); all park rangers who collaborated on the Audio Description of their park brochures in Descriptathon 3; all sighted	Focus Group; Table 1 and 2 questions; conference call with the group, followed by one-on-one semi-structured interviews via phone
November 2017	Yosemite National Park, CA	Six (four female, two male); all members of the California Council of the Blind's Fresno chapter (an ACB affiliate), as a representative sample of the 26 people who tested earlier that day the UniD Audio Description content created by the park's subject matter experts; all blind	Focus Group; Table 1 and 2 questions; in-person meeting
April 2018	Muir Woods National Monument, CA	Nine (five male, four female); all members of the California Council of the Blind's Silicon Valley and San Francisco chapters (ACB affiliates), as a representative sample of the 16 people who tested earlier that day the UniD Audio Description content created by the park's subject matter experts; all blind	Focus Group; Table 1 and 2 questions; in-person meeting
July 2018	Morristown National Historical Park, NJ	Three (all female); all blind	Focus Group; Table 1 and 2 questions; in-person meeting
July 2018	Cape Cod National Seashore, MA	Four (two female, two male); all blind	Focus Group; Table 1 and 2 questions; in-person meeting
July 2018	Minute Man National Historical Park, MA	Four (two female, two male); all blind	Focus Group; Table 1 and 2 questions; in-person meeting

AUDIO DESCRIPTION

description that will provide the user with general information about the purpose and context of the map. They express the need for guidelines that offer a step-by-step procedure for fully describing the map, with suggestions for such things as how to orientate the user to where features are located on a map and how to methodically describe all of the text on a map. Finally, these findings prompt describers to consider how to create a navigation guide for the longer description that will allow users to easily jump from section to section in order to find the information that is most useful for them.

Although audio describing a printed map seems like a complex process that is best left to the professional, we think it can be possible for the layperson to efficiently and effectively describe a map for blind and visually impaired people through referencing a set of specific (but not too specific) guidelines that lead the describer through a logical progression of steps and provide meaningful examples of what constitutes good description. Training and technical assistance in how to audio describe static material is beneficial. User feedback about the description is also important, with the understanding that different users will have different preferences for elements such as description length, orientation, organization, and style. Using a mixed-methods and multi-layered approach to research and practice, we were able to successfully identify potential boundaries of best practices for the audio description of maps, develop an online academy to train NPS park service personnel how to implement those practices, and support the ultimate production of high-quality, audio-described maps for NPS brochures, ready for public consumption.

Through our work with The UniDescription Project, we have demonstrated that it is possible to audio describe a printed map for blind and visually impaired people so that the content is conveyed in an understandable way and so it is useful to a blind person in many of the same ways that it is useful for a sighted person. The step-by-step process that we developed through our research highlights the importance of the following ideas to consider, as examples of the affinity clusters in action:

- **A short description:** A short description is important for providing an overview of the purpose and general content of a map without overwhelming the user with too much descriptive

detail on the front end of the description. As an example of Affinity Cluster A (More Attention Needed), researchers have not yet even addressed how short a short description should be and what it should contain (and leave out).

- **A focus on infrastructure:** The UniDescription Project's website (www.unidescription.org) is both a learning space and a production tool. As an example of Affinity Cluster B (Audio Describers Need Guidance), this site was built to provide both independent online learning, through the UniD Academy, and the backend production system to try out these skills and ideas in real-world situations.
- **The purpose of a map:** Maps serve different purposes, including wayfinding, immersion in historical context, and providing ecological and topographical information. The purpose of a map will affect the ways that the map is used, which also will affect the way the map should be described. As an example of Affinity Cluster C (Boundary Work), theoretical foundations still need to be established, such as the purpose of a map to people who are blind or visually impaired, before too much progress can be made.
- **A long description:** A long description allows blind or visually impaired users to immerse themselves in the map, explore areas of interest, and access the map to the fullest extent possible on par with the sighted user. As an example of Affinity Cluster D (Experimentation Wanted), researchers still do not know how deep or literary these descriptions can go because they typically have not been viewed as a potential audible art form. That is just another way the potential of Audio Description has been unexplored.
- **A navigation guide for the long description:** A navigation guide is essential for an Audio Description that runs for more than a few minutes. The navigation guide allows users to orient themselves to the descriptions and control what they listen to (and for how long). As an example of Affinity Cluster E (Community Outreach), the navigational aspects of Audio Description also offer the potential for increased agency and independence for people who are blind or visually impaired. How might they use that agency to develop novel communities?

Our research revealed that blind and visually impaired people would like to be able to use audio-described maps to navigate National Parks independently, creating their own trails through the spaces. While Audio Description, on its own, can provide access to information about what is printed on a map, it is difficult for the user to truly orient themselves and navigate using print-oriented Audio Description alone, at least as typically designed. For blind and visually impaired park users, providing an “alternative format” to a map, particularly a wayfinding map, may mean developing a new product from the ground up with blind users in mind. Possibilities for future development include creating an audio-described map that is based on how blind and visually impaired people navigate rather than how sighted people navigate, adapted for blind people, integrating the use of electronic geolocation tools, and using multiple layers of map representation (tactile and auditory in tandem, for example).

As discussed in this paper, each stage of our research further raised questions worthy of empirical inquiry. Persistent questions include: 1) What level of detail is desirable in audio describing a map? The answer is variable, as in, it depends. 2) Should Audio Description of a map focus more heavily on general content, orientation, wayfinding, or some specifically ratioed combination? Maybe different types of digital Audio Description can be offered simultaneously, allowing the user to choose the need to be fitted. 3) What is the best use of an audio described map? Probably the use that gets the most engagement, but we do not even know what that would be. And so on. Further research is needed to develop and test the effectiveness of our best-practices guidelines, both in terms of ease of use for describers and usefulness of the resulting product for users. Additionally, more research is needed to determine the ways that blind and visually impaired people use and access maps, which should impact the development and design of maps for this population.

As we experimented with the ideas raised by the stakeholders, we began to discover common beliefs or themes among the leaders in the community but were unable to fully determine if those were fundamentally cultural, circulated within a particular community of practice, or independently robust, able to withstand empirical scrutiny. This led us to identify both the Affinity Cluster sections of this paper and also many

gaps between and around those clusters. In practicality, those clusters can serve both as magnetized points of interest and beginning boundary objects of a much larger area of study, ripe for exploration and definition.

We learned that high-quality Audio Description does not just emerge from a writer, even one with subject-matter expertise and training in place interpretation, without a significant amount of discussion beforehand about what Audio Description is, as a transmodal-translation process, and what our consultants recommend as best practices. In other words, audio describing is clearly a learned skill that needs significant support and guidance. And we have much to learn. Map descriptions from our pilot Descriptathon, for example, yielded mixed results, predicated primarily on the experiences the subject matter experts previously had with other Audio Description projects. Those with experience provided map descriptions that were more richly detailed and useful; the others, though, wrote basic descriptions, like alt text, and left out much of the map detail. Many were difficult to follow. In post-Descriptathon interviews with the subject matter experts who had described maps, we learned that maps were exceedingly difficult for all of the describers but particularly challenging for those with little experience writing Audio Description. This finding fueled the clear need for a deeper and more thorough emphasis on the development of best-practices guidelines, specifically for maps.

REFERENCES

- American Foundation for the Blind. (2018, May). Facts and figures on adults with vision loss. <http://www.afb.org/info/blindness-statistics/adults/facts-and-figures/235>
- Bazeley, P. (2017). *Integrating analyses in mixed methods research*. SAGE Publications, Inc.
- Bergeron, R., & Redlitz, S. (2015, March 20). Does National Park Service have a youth problem? <https://www.cnn.com/2015/03/19/us/im-national-parks-older-visitors-morgan-spurlock/index.html>
- Bourne, R. R. A., Flaxman, S. R., Braithwaite, T., Cicinelli, M. V., Das, A., Jonas, J. B., Keeffe, J., Kempen, J. H., Leasher, J., Limburg, H., Naidoo, K., Pesudovs, K., Resnikoff, S., Silvester, A., Stevens, G.A., Tahhan, N., Wong, T.Y., Taylor, H.R. Vision Loss Expert Group.

AUDIO DESCRIPTION

- (2017). Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: A systematic review and meta-analysis. *The Lancet Global Health*, 5(9), e888–e897.
- Braun, V., & Clarke, V. (2012). Thematic analysis. In H. M. Cooper & P. M. Camic (Eds.), *APA handbook of research methods in psychology* (pp. 57–71). American Psychological Association.
- Buzzi, M., Buzzi, M., Loporini, B., & Martusciello, L. (2011). Making visual maps accessible to the blind (C. Stephanidis, Ed.). In *Universal access in human-computer interaction*. 6th international conference, UAHCI 2011, held as part of HCI International 2011, Orlando, FL, USA, July 9–14, 2011: Proceedings. Springer.
- Getto, G., & Sun, H. (2017). Localizing user experience: Strategies, practices, and techniques for culturally sensitive design. *Technical Communication*, 64(2), 89–94.
- Glaser, B. G., Strauss, A. L., & Strutzel, E. (1968). The discovery of grounded theory; strategies for qualitative research. *Nursing Research*, 17(4), 364–365.
- Gonzales, L., & Turner, H. N. (2017). Converging fields, expanding outcomes: Technical communication, translation, and design at a non-profit organization. *Technical Communication*, 64(2), 126–140.
- Gonzales, L., & Zantjer, R. (2015). Translation as a user-localization practice. *Technical Communication*, 62(4), 271–284.
- Guest, G., & McLellan, E. (2003). Distinguishing the trees from the forest: Applying cluster analysis to thematic qualitative data. *Field Methods*, 15(2), 186–201.
- Krippendorff, K. (2019). *Content analysis: An introduction to its methodology*. SAGE Publications, Inc.
- Lam, C., & Boettger, R. (2017). An overview of research methods in technical communication journals (2012–2016). In Professional Communication Conference (ProComm), held as part of ProComm 2017, Madison, WI, USA, July 23–26, 2017.
- Macia, L. (2015). Using clustering as a tool: Mixed methods in qualitative data analysis. *The Qualitative Report*, 20(7), 1083–1094.
- Meloncon, L. (Ed.). (2013). *Rhetorical accessibility: At the intersection of technical communication and disability studies*. Routledge.
- Montello, D. R., Fabrikant, S., & Davies, C. (2018). Cognitive perspectives on cartography and other geographic information visualizations. In D. R. Montello (Ed.), *Handbook of behavioral and cognitive geography* (pp. 177–196). Edward Elgar.
- Moore, K. R. (2017). The technical communicator as participant, facilitator, and designer in public engagement projects. *Technical Communication*, 64(3), 237–253.
- National Federation of the Blind. (2009). *The Braille Literacy Crisis in America* (Rep.). National Federation of the Blind.
- National Federation of the Blind. (2018, June 12). Blindness Statistics. <https://nfb.org/blindness-statistics>
- National Park Service. (2011, July). Annual Visitation Highlights. https://www.nature.nps.gov/socialscience/docs/CompSurvey2008_2009RaceEthnicity.pdf
- National Park Service. N. (2016, April 25). NPS Visitation Trends. <https://www.doi.gov/oc/nps-visitation-trends>
- National Park Service. (2018, July 26). Annual Visitation Highlights. <https://www.nps.gov/subjects/socialscience/annual-visitation-highlights.htm>
- Newfield, D. (2014). Transformation, transduction and the transmodal moment. In C. Jewett (Ed.), *The routledge handbook of multimodal analysis* (pp. 100–113). Routledge.
- Ostroff, E. (2011). Universal design: An evolving paradigm. In W. F. Preiser & K. Smith (Eds.), *Universal design handbook* (pp. 34–42). McGraw-Hill.
- Oswal, S. K. (2013). Exploring accessibility as a potential area of research for technical communication: A modest proposal. *Communication Design Quarterly Review*, 1(4), 50–60.
- Reynolds-Dyk, A. (2014). Book review of design meets disability and rhetorical accessibility. *Technical Communication Quarterly*, 23, 160–164.

- Rott, N. (2016, March 09). Don't care about national parks? The park service needs you to. <https://www.npr.org/2016/03/09/463851006/dont-care-about-national-parks-the-park-service-needs-you-to>.
- Schinazi, V. R., Thrash, T., & Chebat, D.-R. (2016). Spatial navigation by congenitally blind individuals. *Wiley Interdisciplinary Reviews. Cognitive Science*, 7(1), 37–58.
- Shivers-McNair, A. (2017). Localizing communities, goals, communication, and inclusion: A collaborative approach. *Technical Communication*, 64(2), 97–112.
- Stock, W. A., Peterson, S. E., Hancock, T. E., & Verdi, M. P. (1995). Mental representations of maps and verbal descriptions: Evidence they may affect text memory differently. *Contemporary Educational Psychology*, 20(3), 237–256.
- Thinus-Blanc, C., & Gaunet, F. (1997). Representation of space in blind persons: Vision as a spatial sense? *Psychological Bulletin*, 121(1), 20–42.
- World Health Organization (2017, October 11). Vision impairment and blindness. <http://www.who.int/en/news-room/fact-sheets/detail/blindness-and-visual-impairment>

ABOUT THE AUTHORS

Megan Conway is an assistant professor and the director of instruction and training at the Center on Disability Studies at the University of Hawaii at Manoa in Honolulu, HI. She is editor of the *Review of Disability Studies: An International Journal*, and her scholarship focuses on accessibility issues. She is available at: mconway@hawaii.edu.

Brett Oppegaard is an associate professor in the School of Communications at the University of Hawaii at Manoa in Honolulu, HI. His scholarship focuses on the study of medium distinctions within ubiquitous computing environments, primarily oriented toward the impacts of mobile technologies. His research has been published in *IEEE Transactions on Professional Communication*, *Mobile Media and Communication*, and the *Journal of Technical Writing and Communication*. He is available at: brett.oppegaard@hawaii.edu.

Tuyet Hayes is a doctoral student in University of Hawaii's Learning Design and Technology Ph.D. program. She can be reached at: tuyhayes@hawaii.edu.

Manuscript received 24 September 2018, revised 19 November 2018; accepted 28 December 2018