



Sci/Comm Scholars: A Facilitated Peer-To-Peer Working Group for Integrating Rhetorical and Social Scientific Approaches for Inclusive Science Communication

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Graduate students emerging from STEM programs face inequitable professional landscapes in which their ability to practice inclusive and effective science communication with interdisciplinary and public audiences is essential to their success. Yet these students are rarely offered the opportunity to learn and practice inclusive science communication in their graduate programs. Moreover, minoritized students rarely have the opportunity to validate their experiences among peers and develop professional sensibilities through research training. In this article, the authors offer the Science Communication (Sci/Comm) Scholar's working group at The University of Texas at San Antonio as one model for training graduate students in human dimensions and inclusive science communication for effective public engagement in thesis projects and beyond. The faculty facilitated peer-to-peer working group encouraged participation by women who often face inequities in STEM workplaces. Early results indicate that team-based training in both the science and art of public engagement provides critical exposure to help students understand the methodological care needed for human dimensions research, and to facilitate narrative-based citizen science engagements. The authors demonstrate this through several brief profiles of environmental science graduate students' thesis projects. Each case emphasizes the importance of research design for public engagement via quantitative surveys and narrative-based science communication interventions. Through a faculty facilitated peer-to-peer working group framework, research design and methodological care function as an integration point for social scientific and rhetorical training for inclusive science communication with diverse audiences.

Keywords: science communication, citizen science, hispanic serving institutions, human dimensions research, public engagement, peer mentoring, STEM equity, validation

INTRODUCTION

Graduate students emerging from STEM programs face inequitable professional landscapes in which their ability to practice inclusive science communication with interdisciplinary and public audiences is essential to their success. Yet these students are rarely offered the opportunity to learn and practice inclusive science communication in their graduate program. Moreover, minoritized students rarely have the opportunity to validate their experiences among peers and develop professional sensibilities through training. This gap can perpetuate inequitable representation within science communication which is intended to benefit society as a whole. While the number of opportunities for STEM graduate students to engage in all kinds of science communication has arguably never been more abundant, many opportunities are presented as “one-and-done” science communication workshops. We acknowledge programs are often restricted to these models, and that they can be a good first step. However, we urge programs to look beyond them where possible as they rarely provide the breadth of skills needed for graduates to succeed in the workplace (Druschke et al., 2018; Priest et al., 2018; AAAS, 2016; Nisbet and Scheufele, 2009), and we know these models often lack the capacity to engage in meaningful mentoring that addresses inequities in STEM professions. Simply put, there is still a need for models that directly integrate inclusive science communication training into STEM graduate student research training (Dewsbury, 2017; Canfield et al., 2020). While research training can provide the necessary technical know-how, inclusive science communication training can cultivate facility with translating technical information with diverse public audiences. Thus, one question moving forward is how to achieve integration among science, communication, and equity when, by-and-large, STEM graduate curricula simply lack capacity to embed inclusive science communication into their graduate programs of study.

The repercussions for inadequate training in inclusive science communication may be especially relevant for graduates of environmental science and ecology at minority-serving institutions who often work in landscapes where conservation and management decisions can be governed by a complex mix of politics, economics, social norms, and the values and attitudes of diverse stakeholders (Brook et al., 2003). Here, graduates of our programs may face resistance to actions which promote sound management of natural resources, especially where property rights dictate access to land (Moon et al., 2021), where laws and regulations restrict land use practices, or where actions may result in economic losses (Olive and McCune, 2017; Brook et al., 2003). Several suggestions relevant to preparing our students for working in these complex landscapes have been described (Ranjan et al., 2019; Smith et al., 2019; Carr and Hazel, 2006), including training in human dimensions research and science communication. Indeed, calls for human dimensions in graduate research training are increasingly common because they provide the skills needed for understanding how people influence natural resource management, and how natural resource management affects people (Smith et al., 2019; Jacobson and McDuff, 1998). Thus, integrating social scientific approaches from human dimensions with broader rhetorical approaches from inclusive science communication can provide an ethical approach to understanding and communicating effectively with diverse stakeholders, while promoting scientifically

informed natural resource management (Priest et al., 2018; Druschke and McGreavy, 2016; Pace et al., 2010). Furthermore, doing this integrative work for minoritized graduate students at minority-serving institutions helps to ensure that access to this professional training is provided for those who may not have this exposure otherwise.

As we know, learning about science communication and human dimensions for a few hours is not a substitute for doing this work in research-based settings and for diverse public-facing engagements. One path toward meeting the demands for dynamic science communicators is to integrate inclusive science communication and human dimensions training early and often in STEM graduate programs (Canfield et al., 2020). Furthermore, this integration should not limit opportunities for technical scientific learning, but rather complement it so training in inclusive science communication becomes a motivation for increasing content knowledge. While scientific learning deals in data, creating social knowledge from technical information is an applied rhetorical practice where stochastic contexts shape knowledge in consequential ways for building trust across various levels of expertise (Walsh and Walker, 2016). In short, translating scientific information to create social knowledge is context dependent, and creating knowledge for technical/scientific communities will not be the same process as creating knowledge for diverse publics. Thus, the goal of any integrative human dimensions and science communication training should be a dexterity and dynamism that allows graduate students to develop a deep contextual knowledge of human dimensions and science communication in ways that validate their experiences from peers, professors, and publics (Walker, 2017).

In this context, we developed the Sci/Comm Scholar’s working group at The University of Texas at San Antonio (UTSA) through Project ASSIST (Advancing and Strengthening Science Identity Through Systematic Training), a program funded through an NSF-NRT-IGE¹ grant (Linton, 2013; Bush et al., 2016). The ASSIST grant was conceptualized to develop science leaders from minoritized groups enrolled in the Master of Science (MS) in Environmental Science program through holistic mentoring with systematic training in science writing and science communication. As UTSA is a minority-majority Hispanic Serving Institution (HSI), it was vital that the support being provided was tailored to support the specific needs of our students, many of whom are from underserved communities. Thus, the ASSIST interventions were specifically formulated based on literature indicating the importance of effective mentoring and communication training in supporting Latinx students, and minoritized students more broadly (e.g., Nora and Crisp, 2007; Cerna et al., 2009; Galvez et al., 2014; Simpson et al., 2015). Through a series of graduate courses, professional workshops, and peer and near-peer mentoring activities the project sought to support and validate minoritized students’ identities as scientists. While this team successfully implemented science communication training into the MS Environmental Science program—*via* course-based

¹National science foundation-national research traineeship-innovations in graduate education.

science communication projects, science narrative workshops, and community outreach—the team also saw a need to provide robust training in human dimensions research and science communication practices to support students' MS thesis projects. Once the COVID pandemic hit in the Spring of 2020 and all activities were required to move online, the science communication team from Project ASSIST—which consisted of scholars with expertise in science communication, education, and science identity (Dr. Kenneth Walker and Dr. Amelia King-Kostelac)—collaborated with Dr. Jennifer Smith—Assistant Professor in The Department of Integrative Biology and PI of the Smith Lab at UTSA—to create the Sci/Comm Scholar's working group. The working group provided a virtual format through which environmental science MS students could develop science communication and human dimensions research skills which were relevant to their thesis projects.

Given the broad scope of Project ASSIST to integrate inclusive science communication early and often, the Sci/Comm Scholar's working group allowed us to deepen that exposure and apply this knowledge to specific thesis projects. Placing focus on students' current research was key to providing training which could bridge social science and science communication theory with practical application in human dimensions research. The purpose of UTSA's Sci/Comm Scholar's working group, and Project ASSIST more generally, was to promote diversity, inclusion, and equity in science by fostering a sense of belonging and science identity for minoritized students at HSIs like UTSA (Chen et al., 2021). We now recognize this project to be part of a larger effort to support and develop inclusive science communication where inclusion, equity, and intersectionality ground all research and practice (Canfield et al., 2020, 2; Dewsbury, 2017). In bringing education and science communication researchers and practitioners into a STEM department, the project embraced varied forms of expertise and ways of knowing through a focus on holistic mentoring and validation theory (Ko et al., 2014; Crisp, 2011; Rendon and Muñoz, 2011; Crisp and Cruz, 2010; Nora and Crisp, 2007; Rendon, 1994), science writing via writing-to-learn (Druschke et al., 2018; Schultz and Gere, 2015), and public science communication (Pielke, 2007; Nisbit and Scheufele, 2009; Scheufele, 2014; Druschke and McGreavy, 2016; Walker, 2017). Much like inclusive science communication, UTSA's Sci/Comm Scholar's working group was an intentional investment in supporting and recognizing inclusion, equity, and intersectionality from its initial ideas to implementation and evaluation (Canfield et al., 2020).

MATERIALS AND METHODS: INSTITUTIONAL SITE AND CONTEXT FOR THE FACILITATED WORKING GROUP

Working Group Model

We chose a facilitated working group model to promote faculty-to-peer and peer-to-peer interactions around science communication, human dimensions, thesis research, and inclusion, equity, and intersectionality in STEM. Although

research on working groups, specifically, is sparse, our team drew from robust bodies of literature on both Communities of Practice (Wenger, 2007; Wenger et al., 2002; Wenger, 1998) and peer and near-peer mentoring (Abeywardana et al., 2020) in developing the Sci/Comm Scholar's working group. Research suggests that Communities of Practice can be integral to creating programmatic and institutional change, provided that such communities have well-defined goals, a clearly articulated structure for collaboration, and commonly shared understanding of how to support minoritized students' success in STEM in both the near- and long-term (Kezar and Gehrke, 2017). For the Sci/Comm Scholars, a key component of this collaborative structure was faculty and peer mentoring, which has been shown to be influential on both academic and professional success for minoritized students, as it provides space for students to experience validation, to engage in realistic self-assessment, and to develop self-efficacy (Trujillo, et al., 2015; Ko, et al., 2014; Nora and Crisp, 2007; Lave and Wenger, 1991). Furthermore, studies have also indicated that not having access to mentoring relationships can result in students having access to fewer field research experiences, and increase the likelihood that minoritized students leave STEM for other disciplines (Carlone and Johnson, 2007; Johnson, 2007).

Prior studies have also indicated that inclusive, culturally responsive experiential learning and exposure to research can be significant factors in student success, particularly for minoritized STEM students (e.g., Bowser and Cid, 2021; Núñez, et al., 2019; Posselt, et al., 2019; Schultz, et al., 2011); however, the success of such interventions cannot be taken as a foregone conclusion, much as we cannot assume that all science communication training is *de facto* beneficial. Dewsbury (2017), for example, emphasizes the need for curriculum and program design to be attentive to the social, cultural, institutional and geographic context for the learning, as well as to cultivation of a culture of trust among faculty and students. Kezar and Gehrke's (2017) mixed-method study of four such inclusive STEM programs demonstrated the degree to which the success of such programs may be determined by the cultivation of distributed program leadership (inclusive of all stakeholders) who can provide a broad base of support to create and/or cultivate a transformative community of learning which is committed to creating a culture of inclusivity (Kezar et al., 2015).

In this regard, the research described here demonstrates the high degree of consistency in factors cited as important to supporting minoritized students through mentoring and validation, inclusive and culturally relevant pedagogy, and inclusive science communication. Institutional commitment—in terms of resources, programming and curriculum—is essential, a fact driven home by research on Communities of Practice. But also important to student success is developing strong mentoring relationships, cultural validation, and access to a breadth of opportunities to engage in field and lab research with faculty. The format of the Sci/Comm Scholar's working group was conceptualized to provide the mentoring, validation, and research experience to create a complementary relationship to the larger ASSIST grant, which provides students with additional financial resources and

professionalization opportunities. Given the unique methodological demands of research engaging human dimensions and science communication we saw the working group as an ideal mechanism for our students to have access to robust faculty and peer mentoring within a setting which centered the students' role as scientists engaging the public through their thesis research.

Institutional Context

The University of Texas at San Antonio (UTSA) is a designated HSI with 57% of UTSA students identifying as Hispanic/Latinx. As a majority Hispanic/Latinx institution with a large percentage of first-generation students, cultivation of committed Communities of Practice is particularly important considering educational persistence and belonging may be higher for minoritized students who attend HSIs (e.g., Rodríguez and Calderon Galdeano, 2015). Furthermore, racial and ethnic identity salience and academic self-conceptualization may be higher for students identifying as Hispanic/Latinx who have attended an HSI (Garcia, et al., 2018; Cuellar and Johnson-Ahorlu, 2016). Nonetheless, this is again contingent on the robust provision of programs and resources developed to specifically address the needs of the student population, institutional resources, and the social and cultural context at that particular institution. For UTSA, there continues to be rigorous debate around how the "Hispanic Serving" component of its educational mission is reflected in programming, resources and student support. However, this is not unique. It is, rather, reflective of the manner in which HSIs differ, definitionally and historically speaking, from other minority-serving institutions (MSIs) such as Historically Black Colleges and Universities (HBCUs) and Tribal Colleges and Universities (TCUs), as HSIs are legally defined based on enrollment (25% or more Hispanic/Latinx students) rather than by an historically-rooted educational mission to serve a specific racial or ethnic group (Santiago, 2006). UTSA's identification as a "Hispanic Thriving Institution" comes from this debate: what does it mean to not merely enroll, but to serve students identifying as Hispanic/Latinx at the institution? Organizations like the Hispanic Association of Colleges and Universities and Excelencia in Education have helped provide structure and direction, by providing resources, research and guidelines for building and supporting institutional missions that explicitly aim to serve Hispanic/Latinx students (Santiago, 2006).

This debate is particularly germane for UTSA, an institution whose educational mission has been entwined with reform movements seeking improvement in educational access and quality for underserved communities across South and West Texas. Founded in 1969, UTSA's funding and growth as an institution is linked to several key legal cases and legislation which lead to investment of money and resources to support research universities in South and West Texas. First, the Mexican American Defense League's (MALDEF's) represented two class action lawsuits (LULAC vs. Clements, 1987; LULAC vs. Richards, 1993) which articulated the disparity of educational attainment and employment rates in North Texas (higher per capita income and high density of higher education institutions, despite being

geographically smaller) compared with South Texas (Carales and Doran, 2020). Concurrently with these cases moving through the legal system, the South Texas/Border Initiative (ST/BI, 1989) aimed to increase access to both undergraduate and advanced degrees through expansion of resources and programs across previously under-served regions of South and West Texas. UTSA's identity as a HSI was touted early, with university president Arleight Templeton stating that UTSA would offer "specially designed program (which) will allow Mexican American students to take half their degree requirements in Spanish" (quoted in De Oliver, 1998, 274); a dream which did not materialize. In addition, the location of the main campus far outside the city center, and far from the predominantly Hispanic/Latinx neighborhoods of the south and westside of San Antonio, created a contradiction between the mission to increase educational equity, with a choice of location that placed greater financial and transportation burdens on the same students who institutional leaders stated a desire to serve. This underlines the extent to which institutions, even when ostensibly created to serve minoritized communities, struggle to follow through on this promise of equity.

Many recent initiatives from UTSA have aimed to address these historically-rooted and persistent inequitable distribution of resources and opportunities for the universities minoritized students, the majority of whom are Hispanic/Latinx through a combination of internal strategic initiatives and external grant-funded programs. ASSIST is one of several grant-funded initiatives [e.g., RISE Initiative and Geoscience Pathways Program (Haschenberger, et al., 2021)], which focus on providing more access to robust mentoring, experiential learning, and discipline-specific professionalization opportunities for minoritized students. The Sci/Comm Scholar's working group represents one targeted component of this larger effort, one which focuses on developing key components of a transformative learning community—distributed leadership and interdisciplinary expertise to develop key communication and human dimensions focused ecological research.

This background is provided to underscore the degree to which successful interventions focused on inclusive science communication skills must reckon with institutional and geographic contexts of inequity to realistically engage broader publics and communicate with communities that continue to be marginalized in much scientific discourse. It also situates the degree to which UTSA's students' research and perspectives are precisely those which need to be empowered and supported via inclusive science communication work.

Development and Structure of the Sci/Comm Scholar's Working Group

Sci/Comm Scholars for the working group were recruited from students enrolled in the MS Environmental Science (ES) program housed within The Department of Integrative Biology at UTSA. The Sci/Comm Scholar's working group was optional and participation was voluntary. The ES Master's program is designed to prepare students for careers in both private and

government sectors. Students enrolled in the program may elect to follow a thesis track or professional (non-thesis) track. The purpose of the thesis track is to gain experience and competency in a research topic by following the scientific process that culminates in a written thesis suitable for peer-reviewed publication. Research opportunities are available to thesis students from diverse fields including freshwater ecology, microbial ecology, restoration ecology, terrestrial ecology, and wildlife ecology. The non-thesis track provides exposure to a wide range of areas of environmental science and ecology through a coursework-focused curriculum. Following graduation, available data reflecting employment status of 55 graduates from the program suggests that a majority of students gain employment in industry (34.55%; $n = 19$)—either as environmental scientists ($n = 15$), software developers ($n = 2$), or GIS analysts ($n = 2$)—or are employed by governmental agencies, 47.37% ($n = 9$) work for local governmental agencies, while 31.58% ($n = 6$) work for state-level governmental agencies; 21.05% ($n = 4$) work for federal agencies. Graduates from the program also pursue additional educational opportunities (7.27%, $n = 4$), are employed at higher education institutions or in the K-12 sector (21.82%), or work for Non-Governmental Organizations (1.81%, $n = 1$).

In Spring 2021, when the Sci/Comm Scholar's working group was formed, the ES Master's program hosted 45 students, 32 of whom were enrolled as thesis-seeking students, 12 as non-thesis seeking students, and 1 as a certificate-seeking student. Of the enrolled students, 57.78% identified as Hispanic/Latinx, 40% as Non-Hispanic/Latinx, with 2.22% not disclosing their identity. In recruiting, we made an intentional effort to support women who were enrolled as thesis students, and who were conducting research that substantively integrated science communication and/or human dimensions, so participation as a Sci/Comm Scholar would support their professional/academic goals. The goal of this selection process was not only to ensure our approach promoted the success of minoritized students, but also to provide a safe and supportive space for students to discuss specific challenges they have experienced as scientists engaged in field work and public outreach. The latter of these two goals is supported by research on success factors for women and minoritized women in STEM, which indicates the development of peer-to-peer models can provide validation of students skills and competence, as well as develop supportive and long-term professional relationships (Ong et al., 2018; Kachchaf et al., 2015; McCormick et al., 2014; Carlone and Johnson, 2007). In total, six Sci/Comm Scholars were recruited to participate, four of whom are co-authors and presenting their experiences here in this article. All of the Scholars were supported through a stipend of \$1,600 per semester over the course of two semesters (August 2020 to December 2020 and January 2021 to May 2021). We held virtual meetings every 2 weeks among three faculty (Drs. King-Kostelac, Smith, Walker) and three-to-five students. Two of the faculty also identify as women (Dr King-Kostelac, Smith); this selection was intentional to promote a sense of belonging and inclusion, and to provide a space in which students could more easily construct an imagined future.

The Sci/Comm Scholar's working group was designed to support graduate student thesis research with human

dimensions and science communication components through a working group model. We focused on integrating science communication and human dimensions research to complement technical scientific learning through readings, discussions of methodology, and thesis projects. We also discussed equity in professional workspaces, navigating hostile interactions (sometimes within the workplace), and intersectional approaches to science communication broadly. This facilitated working group approach promoted a more informal setting that combined expertise in social science research methods (Dr. King-Kostelac), rhetorical approaches to science communication (Dr. Walker), and ecological research and associated methods (Dr. Smith), along with all the expertise and ways of knowing brought to the group by the Scholars, many of whom were already working professionals in their respective fields. Supporting student's development of science communication via research-based thesis projects allowed us to combine rhetorical and social scientific approaches in two ways: first, through development of quantitative human dimensions surveys and, second, through science-based narratives for citizen science projects (Neely et al., 2020).

Sci/Comm Scholar Expectations and Deliverables

As Sci/Comm Scholars, students were expected to: 1) design an MS thesis-level research project that integrated human dimensions, science communications, and/or public engagement as a critical component of scientific research, 2) with support from working group faculty, spend 6–8 h per week on science communication research and programatics (e.g., examining the role that science communication plays in shaping environmental attitudes/value orientations, and how to best communicate scientific and technical information with diverse audiences across a variety of media), 3) co-create print and digital materials for sustaining the Sci/Comm Scholar's working group, and 4) communicate their science through a variety of media relevant to their research (e.g., social media, professional newsletters, etc.).

Deliverables developed as part of the Sci/Comm Scholar's working group included: 1) thesis research with a transdisciplinary environmental science or ecology focus; 2) an archive of print and digital materials created by the Sci/Comm Scholars; 3) a guidelines document for future Sci/Comm Scholars, 4) a bibliography of resources current and future Sci/Comm Scholars can use to improve their research and public engagement skills; 5) a Sci/Comm Scholar contract to be signed by both Sci/Comm Scholars and their faculty advisors indicating they understand the requirements, benefits and compensation attached to participating in the Sci/Comm Scholar's working group.

RESULTS AND DISCUSSION: PROFILES OF RESEARCH AND COMMUNICATIONS TRAINING FOR SCI/COMM SCHOLARS

In this section, we provide profiles of four Sci/Comm Scholars who collaborated with our facilitated working group over the last

year of pandemic-induced virtual sessions. Each student's profile is written as a narrative to address the following questions:

- 1) Why were you interested in becoming a Sci/Comm Scholar? Did the objectives of the Scholar's working group align with a career you hope to pursue?
- 2) What is your project and who are the stakeholders? [i.e., Home Owners Associations (HOAs)/neighborhoods, private landowners, state agencies, etc.].
- 3) How did you integrate science communications and/or human dimensions research methods into your thesis project? To what effect? Please describe the range of approaches you engaged in your research (e.g., oral, written, visual).
- 4) How was your experience with the facilitated peer-to-peer working group model? Did the experience of working with your peers and faculty have an effect on your own project, or on your understanding of science communications and/or human dimensions more generally?
- 5) Has your participation in the Sci/Comm Scholar's working group changed your perspective on public engagement? Or on science and its careers more generally?

The following profiles are provided by four MS thesis students recruited into the Sci/Comm Scholar's working group, all of whom identify as women in STEM and who substantively integrated science communication and/or human dimensions into their thesis research design. Eres Gomez and Jamie Killian joined the ES Master's program in Fall 2018, Sarah Gorton in Spring 2019, and Mary Finucane in Fall 2020. Three of the four Scholars are currently in the professional workforce as wildlife biologists or environmental scientists. They are all co-authors on this article.

Scholar One: Eres Gomez

My name is Eres Gomez. 2021 I am a native Texan born and raised in San Antonio. I identify as a Hispanic/Latina woman with Native American/Indigenous ancestry rooted in the Tejas region. I have lived in San Antonio my whole life and was raised by a single mother in neighborhoods that are low-income working class. I am also a first-generation, non-traditional student attempting to transition into a late-life career change into research and scholarship. I chose to study at UTSA because it is the only affordable university in my city where I have the opportunity to pursue my passion. I attended community college and earned an Associate of Science in Library Technology, and I went on to work in a science and technology library for many years. I then went into veterinary medicine and worked as a veterinary technician, eventually leading me into wildlife rehabilitation. I earned my Bachelor of Arts in Humanities from UTSA and then enrolled in The Department of Integrative Biology's Master of Environmental Science program where I study raptors, which is a broad term used to describe birds-of-prey such as hawks, owls, falcons, eagles, and vultures. My research interests also include the human dimensions of human-wildlife conflicts, especially with regard to contaminants and ecotoxicology. All bird species are very

special to me and I grew up referring to them as "the bird people," because in my native culture, birds are not simply distant organisms related to us phylogenetically, but instead are close family relatives experiencing life in another physical avian form. This phrase is sometimes used at the closing of native ceremonial practices, where the speaker ends by saying, "All My Relations," which is referring to our inter-connectedness to all things, living and non-living, in the natural world. The Earth is our Mother, the Sky is our Father, the Rivers are our Sisters, the Trees are our Brothers, and the Animals are our Relatives—we as Humans have a duty and honor to protect and take care of them. Raptors, to many Native/Indigenous cultures, are extra special, especially eagles, because it is believed that they fly the highest and are closest to God, the Creator.

More specifically, I study the exposure of owls to anticoagulant rodenticides (ARs) through laboratory analysis and humans dimensions research in south-central Texas. Anticoagulant rodenticides are rodent poisons used for pest control. However, they also pose a risk to non-target species, which includes raptors, like owls (Gomez, et al., In Press), that become exposed to these poisons when they depredate contaminated prey (e.g., mice and rats). I tested liver samples of owls admitted into rehabilitation for the presence of eight commonly used ARs. The owls were admitted for various reasons, such as broken wings, electrocution, and no obvious injuries. Preliminary results suggest that over half of the owls tested had ARs present in their system at the time of death (E.A. Gomez, unpublished data). Anticoagulant rodenticides have become so ubiquitous and pervasive in our environment, that they have been detected in numerous species besides the rodents they are intended to control (Gomez, et al., In Press). The thing that fascinates me about pesticides and chemical pollution, including poisons is that these surround us, envelope us, and yet we do not even know they are there until we test for them.

During my data collection at San Antonio's raptor rehabilitation center, I began to realize what an important role humans play in wildlife management, and in my thesis as a whole. People are inadvertently poisoning owls by poisoning their food source (i.e., rodents), yet people are also the ones delivering them to the raptor center for help, sometimes driving 150–200 miles from another city. I saw numerous instances where people showed just how much they cared for these birds. The owls and hawks they had grown accustomed to seeing and hearing in their own backyards were all of a sudden on the ground, not flying, and in need of veterinary care. They would rush the wild bird over to the raptor center, oftentimes transporting it in an elaborate makeshift carrier. At times, dropping off a sick raptor was a family affair involving multiple members, and other times the whole neighborhood got involved in trying to wrangle a frightened raptor into a box for transport. Concerned members of the public even called the raptor center regularly to check on birds they had dropped off, or to contribute donations to help with its medical expenses. People obviously care for these animals, so I held firm to my belief that if they were taught about the risks of ARs to wildlife and shown results of my local testing efforts, then maybe they would be willing to at least consider trying other safer alternatives to poison, or better yet, become so moved by this

cause and inspired to conserve wildlife, that they would decide to venture into grassroots advocacy initiatives and become a catalyst for environmental community science stewardship in their own neighborhoods.

My experiences made me realize the importance of considering people when tackling wildlife issues, and that ignoring the interactions they have with wildlife and subsequent outcomes limits our ability to promote the conservation of species. At the same time, traditional wildlife courses often do not incorporate teachings of human dimensions that prepare students for better understanding the interactions that people have with wildlife (Smith, et al., 2019). Such curriculum is increasingly necessary as human-wildlife conflicts are rising in number, especially with urbanization. To further explore human-wildlife conflicts centered on rodents, ARs, and owls, I needed a way to learn more about, and how to assess what drives members of the public to use certain rodent pest control products (i.e., poison), something not typically done in traditional STEM studies. I had questions like, “Are people’s attitudes towards rodents and owls positive or negative?”, “If people view rodents as negative, are they more inclined to use rodenticide?” and perhaps more importantly, “Can educational intervention be used as a conservation tool to inform the public about the risks of ARs to wildlife, and thereby alter public attitudes and pest control behaviors?”. These were questions that melded into the realms of human dimensions and science communication. Humans are such an integral component of my study system, yet ironically, my academic curriculum was not setup to study them within this context. If I wanted to produce solutions to this problem of AR poisoning in non-target wildlife, I would need to try and get to the root of the issue by understanding the human component.

The Sci/Comm Scholar’s working group gave me the perfect opportunity to explore this second part of my thesis, which investigates the human dimensions of rodenticide provisioning by surveying residents in San Antonio about their attitudes towards rodents and owls, their behaviors centered on rodent pest control, and their knowledge about the potential for ARs to poison owls. Research has shown questionnaire surveys to be effective tools for collecting quantitative and numerical data (Bee and Murdoch-Eaton, 2016) and that they are becoming increasingly popular in ecology studies that involve human-wildlife interactions (White et al., 2005). Yet, despite this growing trend, survey research design is still not typically included in STEM curricula, leaving burgeoning wildlife professionals to enter the workforce unprepared for challenges that may arise when dealing with these complex landscapes that integrate wildlife management techniques for conservation with private landowners and public policy (Smith et al., 2019).

The survey also aimed to determine whether educational intervention can change public knowledge, attitudes, and behaviors, thereby potentially mitigating risk of AR exposure to non-target wildlife. The intervention consisted of a short video that utilized science communication techniques to deliver an educational message that informed the audience about the risks of rodenticide poisoning to wildlife. The Sci/Comm Scholar’s working group provided guidance on the content and delivery

of this short video in order to increase its effectiveness for precautionary advocacy in risk communication. They also assisted me in navigating the Institutional Review Board (IRB) process and launching a pilot test trial run of the survey and video to improve user interface and reliability *via* Qualtrics.

The Sci/Comm Scholar’s working group also provided opportunities for discussions not typically had in my other classes with topics centered on the human element of each of the Sci/Comm Scholars’ projects. It provided a talking space for those with an interest in human dimensions research and science communication, a space seldom found elsewhere. It was insightful to see other Scholars’ projects and work through our challenges together; even though it often felt like our projects each had different themes, they all catered to a similar audience. With the working group, I had the chance to explore ideas for survey methodology and discuss science communication intervention techniques. The working group helped shape my perspective on science communication as public engagement in general and served as a vehicle for my project. By sharing each of our experiences about public engagement, we were able to compare stories and learn to navigate potential conflicts that may have arisen. We shared common concerns and questions we had about discussing our subject matter with the public including topics that are difficult to conceptualize or even controversial to discuss.

Thinking about human dimensions and science communication as part of ecological research was new to me. The fact that each Scholar integrated either human dimensions and/or science communication into their projects in different ways allowed me to understand the relevance of these disciplines in STEM, and to increase my knowledge of how they can be used. I learned a lot from other Scholars’ projects. For example, Sarah’s project highlighted personal interactions she had with the public, preparing me for potential professional interactions in my future career. Likewise, hearing Jamie’s stories about working with the public and what those interactions were like was always interesting and informative. In discussions about other Scholar’s work, each Scholar brought their own thoughts and perspective to the table. These discussions highlighted the importance of coupling human dimensions research with ecological research, especially where the applied perspective must consider diverse stakeholders with different values, attitudes, and behaviors. They also demonstrated that science communication is an essential tool that not only allows scientists to share scientific knowledge with non-scientists but can also be essential for the successful completion of an engaged ecology thesis project.

Scholar Two: Jamie Killian

I am a middle-aged woman and I work in rural Texas. Living in rural communities has influenced how I view myself. On one hand, I think the rural community allowed me to find my own identity because I was unaware of most labels. On the other hand, I felt alone and afraid to be open about my identity because of societal pressures and “norms.” My fears may be self-imposed, but they kept me from openly identifying as a gay woman. I never talked about my fears or asked for help because I did not know

how, or who to ask. I did not know an openly gay person growing up or early in my career. It was normal for me to be the only woman in my working group. I tried my best to fit in with the group and not be seen as a woman much less a gay woman. I still have apprehension about my identity, but I am comfortable enough to live openly. My reluctance to openly identify started with regional and generational pressures and continued because I work in a field that is predominantly white male. I have become more comfortable in my own skin as I have aged, but also as I see new colleagues begin their careers. I do not want them to feel isolated like I did as a young professional. My identity does not determine my success as a professional but my ability to be my full self makes me more successful. I am attending UTSA because it is the first opportunity for me to continue my education relatively close to where I live and work. I am thriving in an environment that is accepting of diversity. One of the biggest benefits from the Master's program has been learning how to connect with people.

My knowledge of human dimensions and science communication research is quite limited. I am very aware of how important both are for natural resource professionals to remain relevant to society and how in general we have not succeeded in knowing our audience to communicate with them. I have participated in efforts to increase and improve hunter recruitment, retention, and reactivation, or the 3 R's my entire 15-years career as a professional wildlife biologist. The state agency for whom I work has spent many hours trying to "fix" this problem. For many years, I struggled with how to solve this "problem" too. Only recently did I recognize that the 3 R's is not a problem. The problem is not recognizing the huge group of people who participate in non-consumptive outdoor activities along with hunters. The Sci/Comm Scholar's working group has helped me find strength among other likeminded professionals. I have struggled to find my voice within my agency and have not asserted the importance of diverse user groups often enough. The Sci/Comm Scholar's working group has helped me to recognize that a non-receptive audience does not mean ideas should be suppressed. The Sci/Comm Scholar's working group has helped me hone my skills to reach diverse audiences in various forms. I will continue to do so as a professional with more confidence. I hope to remain objective when communicating with any audience regardless of my opinions. I would really like to bridge the gap between different audiences as I think we share a common passion for the resource.

Public engagement is a critical component of my research on the local distribution of Texas horned lizards (*Phrynosoma cornutum*). I underestimated the level of importance public engagement and community science would play in my Master's thesis project. Essentially, I would have no data to analyze without the community science reports of Texas horned lizards. I think I am competent when communicating with my community (especially rural communities) and although I had many people reach out to me with sightings, not a single person reported using my iNaturalist project. I did recognize that people were very excited to report sightings to me and grant me permission to use the exact same data as they were asked to report online. I reached out again with a request for sightings to be

reported to me and received 50 reports between March and November of 2020. I also recognized that people responded well to hearing updates. I communicated with the community approximately five times (introduced my research 2019, requested sightings via iNaturalist 2019, requested sightings via iNaturalist 2020, requested sightings directly to me 2020, and updated the community on my findings along with the community sightings). I think the brief updates kept the interest among the community and I believe Dr. Amelia King-Kostelac referred to this concept as exponential interest reporting. I learned of this outcome prior to participation in the Sci/Comm Scholar's working group. I think I had some idea about the importance of communicating my need to the community, but I think luck helped me a great deal. My career has given me opportunity to develop confidence communicating with the public. The Sci/Comm Scholars program reminds me that I need to always keep my mind open to new ideas, technologies, and changing demographics.

I learned a lot about communicating with diverse audiences using a variety of media during the Sci/Comm Scholar's working group. I understand the importance of seeking new audiences and using social media to communicate, but I have not explored most media options. I am very guilty of using what is familiar to me and my agency when communicating to my community. The Sci/Comm Scholar's working group has made me realize that using the various forms of media available is the best education. I would prefer to use science communication accounts so that I do not have to create or use a personal account; I have a strong resistance to setting my own personal account because I think there is a blurred line between personal accounts and professional accounts. In addition, I do not feel that I align with the majority of my agency and I fear retaliation for my personal beliefs and identity. I have really enjoyed being among a more accepting and diverse community at UTSA. I would like the anonymity of a Sci/Comm Scholar's or school account to learn to communicate with various media forms.

I have a strong background working with students and community organizations on science projects. Most of my experience comes from my professional career but I have tried to engage as a fellow student. Since most of my experience has been through my agency, I think I have been very limited in terms of audiences and the way I communicated with them. My agency almost has a sole focus on consumptive wildlife users. Our programs, workshops, and even stewardship awards all center around land managers who use hunting as a management tool. As a Sci/Comm Scholar, I have really enjoyed learning about communicating with diverse audiences. I have lots more to learn regarding ways to reach these diverse audiences effectively. It has been a great help to discuss other Sci/Comm Scholars' projects because I learned about strategies used to communicate with diverse audiences beyond my target audience. I will continue to make an effort to learn about my audience before I speak to them. I will work hard to communicate science in a relatable way to each audience. And, hardest for me, I will work to add a personal touch to how I present science to each audience. I think it is extremely

important not to approach communication with an agenda and the Sci/Comm Scholar's working group reminded me of this.

Scholar Three: Mary Finucane

I began to pursue my Master's degree in environmental science 18 years after receiving my Bachelor of Science in marine biology. Attending graduate school to earn a Master's in a scientific discipline had been a goal of mine for over a decade, but the path to graduate school was not linear for me. I grew up in an affluent area of San Antonio, and after high school graduation, I spent 14 years studying and working in California. When the timing, and quite honestly, my self-confidence, aligned for me to apply to graduate school for a Master's in environmental science, I only applied to UTSA. The primary reason for this is that my family and I are very rooted in this community and moving to a different city or state was not an option I wanted to pursue. Of the other colleges and universities in San Antonio, I was especially attracted to the research being conducted out of UTSA and the potential it offered me to be a part of the local scientific community of my hometown. At the time of my application, I did not know that UTSA was an HSI, or that a large portion of the student body were first generation college students. I am a white female that comes from a family in which every member going back two generations on both my maternal and paternal side have at least a Bachelor's degree. As I have aged, I have become more aware of this familial privilege, and know that many of my fellow graduate and undergraduate students have faced barriers to success that I have not. I do, however, hope to learn more about the needs of our student population and ways in which I can listen to, support, and serve these communities beyond my tuition and financial support of an HSI.

My thesis research focuses on a reintroduced population of an indigenous Black Bass species in an urban environment. Specifically, this research will provide valuable data on the population structure and the success of the reintroduced Guadalupe Bass (*Micropterus treculii*), a species of conservation concern which was one component of the ecological restoration of a 16.9 km stretch of the San Antonio River in 2013. Informal surveys and assessments by the Texas Parks and Wildlife Department (TPWD) and the San Antonio River Authority indicate that the reintroduction has been successful and that there is an actively reproducing population in the reach. However, my project will formally survey and statistically estimate the populations of both the Guadalupe Bass and the Largemouth Bass (*Micropterus salmoides*) in the restored reach. Additionally, I will be quantifying microhabitat use and availability by both species on a seasonal basis to further evaluate how both species are utilizing habitat features that were engineered for native species during the restoration. As a native San Antonian, I am thrilled to work alongside these city and state agencies to evaluate the success of the reintroduction and the river restoration. A unique aspect of my research is that all the field work data collection occurs in the heart of the city, where we are visible to walkers, runners, cyclists, anglers, and kayakers. During my first field season, I learned that many people are interested in my research, yet few know much about the

Guadalupe Bass, or any other fish species that inhabit the San Antonio River. I am particularly motivated to tell the story of the restoration and the reintroduction to fellow San Antonians so they too can take pride in the steps their city has taken to restore original ecological function to our river. Discussions with the Sci/Comm Scholar's working group members based on their projects and experiences have enlightened me to the different ways I can communicate with members of the public to engage them in my research. Through continued collaborations with the Sci/Comm Scholar's working group, I hope to create and implement a public educational component focused on the value and success of the reintroduction of an indigenous freshwater fish species in an urban environment.

As a Sci/Comm Scholar, I have also been able to explore storytelling as a way to communicate with non-scientists (Neely et al., 2020). During my first semester in the Master's program, I was given an assignment to craft a scientific narrative in one of my core classes. This task initially seemed daunting and contrary to all the technical writing I was studying in different classes. We were encouraged to explore our creativity within a large range of scientific topics. I decided to use the assignment to tell the story of how my family ranch has played a role in the development of wind energy in Texas. Before wind turbines became a common sight to anyone traveling along a highway in west Texas, our ranch was home to them because my father was one of the early landowners who worked with developers to lease our land for wind. As my sister and I have become the caretakers of our family ranch, we have witnessed how wind energy has been slowly shaping and integrating itself into the west Texas culture and livelihood. This assignment became pivotal in refining my goals as a student and for my future career. Not only did I enjoy the process of crafting my narrative, but my peers' stories also captivated me. Soon every scientific narrative book that was recommended and referred to in my class was on my nightstand, and I spent my winter break being transported into the wilderness of Yellowstone or the home office of an ecologist studying the alarming cancer rates within her community. As a former high school biology teacher, I know how imperative and challenging it can be to engage our youth, and the public at large, with current scientific research. Yet very little time or energy is spent in the endeavor of storytelling, and those who do publish articles, blogs, or books, are often doing this in addition to all their other responsibilities of conducting research. I knew that I wanted to present my research and experiences to those outside of the scientific community, yet I did not know how to take steps towards this goal, particularly with the demanding schedule of a graduate student and the responsibilities of family life.

Joining the Sci/Comm Scholar's working group provided me with the opportunity to develop my story telling and listening skills, while also creating a community and space for growth. This group provided peer feedback on my piece while also facilitating discussions surrounding the challenges of new technology (e.g., wind turbines) and their environmental implications (e.g., Smith and Dwyer, 2016). The interdisciplinary faculty mentors encouraged me to submit my piece for publication and guided me through the process of selecting and submitting to a

publication. These are necessary skills for post-graduation success that are not often covered in the traditional curriculum. The Sci/Comm Scholar's working group also allowed me to work with students outside of my lab in our department. Through our meetings and discussions over Eres' and Sarah's research, I was exposed to the procedural challenges of creating an unbiased public survey and in garnering participation. Effective use of citizen scientists and social media platforms are additional components of science communication that were addressed through working meetings with Jamie's project. Most importantly, the opportunity to collaborate with students and faculty I may have not otherwise met if not for the Sci/Comm Scholar's working group highlights the importance of creating and maintaining relationships with other scientists, writers, and scholars for effective science communication as a graduate student and beyond.

Scholar Four: Sarah Gorton

I am a white, female, San Antonio native who grew up in the middle-class neighborhoods of north-central San Antonio. I have many privileges that come with this identity, and that cannot be stated enough. However, unlike my other middle and upper-income white classmates in high school I did not go to an Ivy League school. I attended UTSA because it was the only school that offered me scholarships due to my slightly inconsistent academic record. I chose to major in communications knowing it would be very difficult for me to pass the string of chemistry classes required for environmental science. After getting a full-time job in water conservation, I returned to UTSA to pursue a Master's degree since my former mentor encouraged me to return to his lab. I had the means to afford graduate school due to my full-time employment and few universities would accept an undergraduate with a Bachelor of Arts into a Master of Science program. I thought my historic inability to succeed in hard science courses (such as chemistry) was due to lack of ability, but in the last 2 years I have learned that I have a number of mental health disorders that have been the source of many of my struggles. Generalized anxiety disorder, severe recurrent depression, PTSD, and ADHD have plagued me throughout high school and college but went unnoticed and untreated as I met academic standards and excelled in areas that interested me. To further complicate things, in the midst of the Sci/Comm Scholar's working group I began experiencing symptoms for what I learned to be idiopathic hypersomnia, an incurable sleep disorder similar to narcolepsy. Where I had once ridden on the coattails of anxiety and placed my self-worth in my academic achievement, I am now no longer consistently able to stay alert enough to complete much more than an 8-hour day at work. The term "disabled" seemed far away when it was in relation to my mental health, but I now find myself struggling daily to complete more than basic tasks. Most days, it is a delicate dance to balance my former anxiety-fueled, overcommitted workaholic with the new reality of semi-coherent reduced-hour days. Once again I am privileged in

that these are invisible disabilities that prevent me from facing any surface-level discrimination, particularly given that I am also a middle-class white woman.

My thesis research focuses on the uptake of heavy metals by native grasses, and thus their ability to decrease water pollution in urban areas. As urbanization spreads, so too do the associated negative impacts on water quality. Plants can be used to uptake pollutants through a number of processes collectively known as phytoremediation. Certain plants are outstanding at remediating specific pollutants and these plants are referred to as hyperaccumulators. Hyperaccumulator plants are often used for cleaning up heavily polluted soil, but they may not be ideal to introduce to an environment in which they are not native. Of particular concern is heavily polluted soils along roadsides where metal pollution can settle. Here, trees and woody plants often used in phytoremediation may be unsafe to plant (e.g., where there is potential for vehicular damage). Native grasses are easily maintained, safe to grow alongside roads, but have little research around their abilities to uptake heavy metals.

My research is applied in nature. However, the results for my research are not very actionable for most people. For example, action items following a presentation about my research might be to write a letter to local elected officials suggesting they plant native grasses for remediation purposes. Yet, I wanted my research to have a bigger impact than a letter to elected officials. Through discussions with the Sci/Comm Scholar's working group, it became apparent that I had to take a different approach and consider stakeholders. For this reason, my Sci/Comm Scholar's project merged the topics of my thesis and my professional career and looked at understanding knowledge and attitudes towards native plants and the Edwards Aquifer by HOA and neighborhood association members. The project methods involved identical pre- and post-surveys around a presentation on the benefits of native plants for water quality and conservation. Understanding where people's knowledge and attitudes lie and how they are impacted by educational outreach can help environmental science professionals craft targeted messages to encourage higher action rates. In this project, the call to action was encouraging residents to plant native plants in place of some, or all, of a turf grass lawn.

The Sci/Comm Scholars working group was a unique program that felt crafted for my background. As an undergraduate I majored in communication with a minor in environmental science. My undergraduate honors research was on acoustic monitoring of bats (Gorton and Hutchinson, 2019), but I spent my free time volunteering and educating people about the importance of bats and convincing them to love bats as much as I do. When I graduated, I went into the water conservation field where I have found myself crafting messages to encourage San Antonio residents to participate in water conservation programs through the local utility. Within the world of water conservation, there is not a lot of information on the impacts of education and communication efforts on water conservation behaviors. Most research focuses on the science of water savings from specific measures, but at this point most "passive" measures have been implemented at a policy level by requiring flow limits on fixtures.

Now water conservation efforts are focused on outdoor water use which requires education and behavior changes, which ties back into the necessity for human dimensions work.

I found the Sci/Comm Scholars working group's peer-to-peer model to be extremely beneficial. I do not learn well reading from textbooks or watching lectures. For me, learning is easiest when I have to actively participate and have an open dialogue. Having the opportunity to share my ideas with a diverse group of Scholars required me to consider a range of views. Guidance from faculty allowed me to focus on ideas and asking questions without fearing repercussions or hard-learned lessons from a lack of knowledge. Additionally, watching other Scholars develop projects led me to consider how their approaches and methods could apply in my career. For example, Jamie's experiences with landowners having government distrust is something I also experience on a somewhat regular basis. Her workarounds for these issues were unique and gave me inspiration for handling similar issues in the future. Many of the topics and concepts covered were rarely mentioned in my communication or environmental science classes, and if they were it was not explained in a way that I could mesh for use in a human dimensions project. Our discussions on how to work through the cryptic IRB process were invaluable. Discussions around survey design helped me understand what made a survey question helpful and succinct. Perhaps what surprised me the most was how all members of the group (faculty and Scholars) were exceptionally patient and understanding throughout periods of time when my executive dysfunction was abysmal. Patience to that extent is not something I have experienced in a professional setting, and it has had a lasting impact on how I approach others in a work environment knowing how much it meant to me.

My participation in the Sci/Comm Scholar's working group has reinforced my belief that public engagement is important work. During my time as a Sci/Comm Scholar, some of the water conservation programs I assist with at work in my professional capacity have experienced lower participation rates. There is no clear explanation to why this is, but while a normal tactic might be to change up advertising or education techniques the Sci/Comm Scholar's working group has taught me that a more efficient method is to work with your audience to understand their responses directly. The Sci/Comm Scholar's working group has also strengthened my passion for science communication, and highlighted the importance of sharing information from human dimensions research. As an employee of a water utility, I would benefit greatly if another water utility published (peer-reviewed or not) the outcomes of any survey work or science communication projects they have completed. I hope to encourage others to do so by pursuing my own communication and human-dimensions work within my career and making it available to others when possible.

CONCLUSION

These Sci/Comm Scholars' narratives speak to the potential benefits of a facilitated working group model for inclusive science communication. By building a space for faculty-led

and peer-supported human dimensions and science communication thesis work, these Scholars came to learn and rely on one another as much as they did faculty members. The Scholars' narratives are, themselves, evidence of the success of this group, as each narrative demonstrates their skill at communicating their research and professional identity. As the Scholars developed these narratives during the drafting process, we also witnessed the ways they validated, supported and informed each other's perspectives and contributions. Thus, the faculty facilitators deliberately chose not to add additional commentary to these student narratives because we believe they effectively demonstrate the value of peer-to-peer mentoring. While their projects are diverse, these MA thesis projects are unified by common experiences of methodological care with human dimensions and science communication research design, and the validation experienced through a supportive faculty-led peer-to-peer community. This work has not just helped these scholars navigate their thesis projects, but their professional careers as well. Additionally, they showcase how their identities as non-traditional students influenced their decision to attend UTSA, and how this minority serving institution has had a unique impact on each of these scholars' academic experiences and professional developments.

While there are limitations to integrating human dimensions and science communication (it can be difficult to cover the depth and breadth of these fields, for example), we still view this model as a largely successful method of integrating STEM, social science, and the humanities. Even as this program was formulated with intense consideration for the institutional context of UTSA, research suggests that many of the factors outlined here are important to minoritized students at a range of different institution types (e.g., Zaniwski and Reinholz, 2016; Kezar and Gerhke, 2017; Núñez et al., 2019), provided that such programs are part of larger institutional commitment to inclusion and equity (Elrod and Kezar, 2017). Of course, the work of the Sci/Comm Scholars is not yet finished. As most of these students aim to graduate in the next few semesters, everyone will be constantly supporting their work until graduation and beyond. As the National Science Foundation grant period winds down, we are also left with questions of how to sustain this work locally, as well as how to transport this model to similar institutions.

On those points, we note another common thread throughout these narratives: each scholar found immense value in a tailored methodological and communication experience not otherwise supported robustly within the program curriculum. Thus, the Sci/Comm Scholars' facilitated peer-to-peer working group model may be most effectively transferred to other minority serving institutions first before broad application elsewhere. At most institutions, access to robust conversations around research design, research ethics, and the thesis writing process often falls on a single advisor, or at best, a committee. But the faculty-led, peer-to-peer model not only exposed these students to diverse research pathways, it also led to exploring professional opportunities, and motivating their self-learning, largely based upon their peers' experiences and expertise. For faculty, sustaining this work is partly achieved by providing space for social scientists and humanists to serve as external committee members, but we also encourage other STEM departments

toward another, potentially more transformative, next step, which happened for one of our own team members (Dr. King-Kostelac): hire social scientists and humanists to work within STEM departments to facilitate the work of transdisciplinary ecological research that continues to promote a vision of ecology that is deeply social and human, just as the social and the human are deeply ecological.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the UTSA Institutional Review Board. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

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AUTHOR CONTRIBUTIONS

KW, AK-K, and JS conceived the idea of the manuscript. KW, AK-K, JS, EG, JK, MF, and SG all contributed equally as participants of the Sci/Comm Scholar's working group that provided the foundations for this manuscript. JB and KW, along with the rest of the ASSIST team secured funding that permitted this work. KW, AK-K, JS, EG, JK, MF, SG, and JB contributed to the writing and editing of the manuscript and provided final input and approval before its submission.

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