Chapter 5. Structuring Communities of Understanding and Support

In the preceding chapters, I introduced the idea that undergraduate research experiences serve as a "third space" (Bhabha, 1994; Gutiérrez et al., 1999; Soja, 1996; Moje, et al., 2004)—a space where "different instructional, home, and community knowledge bases and Discourses" (Moje, et al., 2004, p. 41) come in contact with one another in important ways. I also explored the way these spaces can demand certain performances by minoritized individuals within them and the social and emotional implications of such performativity. Here, I will expand on the small and large acts of resistance to these challenges that occurred in PRISM at both an individual and institutional level, illustrating the ways in which a third space can contribute to building a *counterspace*—a safe space of negotiation, initiation, inclusion, and critique.

More than simply "safe social spaces," (Ong et al., 2018, p. 207), counterspaces are intentional settings that allow for adaptive responding, spaces where marginalized individuals can "maintain psychological well-being despite oppressive conditions" through employment of coping, resilience, and resistance (Case and Hunter, 2012, p. 259). Counterspaces may take varied forms, from formalized initiatives to individual relationships that are explicitly cultivated, but all allow lived experience to be acknowledged and validated. Adaptive responding, as Case and Hunter (2012) explain, can be enacted through narrative identity work (e.g., resisting traditional storylines related to race, gender, or discipline), acts of resistance (e.g., challenging traditional norms), and direct relational transactions (e.g., the relationships between individuals that foster security and autonomy), all of which are discussed in this chapter. Though PRISM does not explicitly name itself as a counterspace, many of the activities and structures built into it serve to facilitate mutual understanding and support, and many of the relationships nurtured within the program offer BIPOC and female students a space to actively challenge oppressive forces.

Narrative Identity Work

The narratives people tell themselves about where they belong and what they are capable of (their storylines) become "a process through which individuals or collectives give meaning to themselves and others" (Case & Hunter, 2012, p. 262). Through narrative identity work, or work that actively resists traditional, oppressive narratives, it is possible to "bring about healing and restoration to marginalized individuals through contesting pejorative societal representations relative to these individuals and their reference groups" (Case & Hunter, 2012, p. 262). One way that PRISM has structurally incorporated narrative identity

work involves support and promotion of students to aid in their ability to see themselves *as* scientists.

At the early stages of involvement, students receive funding to participate in undergraduate research, which not only helps to offset income lost to time in the laboratory but also validates students *as* academic researchers. While this does not fix all of the fiscal demands students have (Ruben still had to work 30 hours a week, for example, to pay for school and care for family), it certainly alleviates some of the burden. In addition to funding their research, PRISM also provides students with white laboratory coats (counteracting stereotypes of who is allowed to wear one) as well as promotional pins and embroidered graduation sashes. Though seemingly small acts, these items publicly mark students as part of the PRISM community and, by extension, the STEM community, acting as microinclusions and emphasizing that they belong. The research experience culminates in two instantiations that further validate and recognize students as scientists: the first, a publication known as the "Undergraduate Research Chronicle," and the second, a day-long undergraduate research symposium where students present their research to the public.

The "Undergraduate Research Chronicle" began in 2010 as a means to recognize the work students engage in as scholars. This full-color, glossy booklet dedicates half a letter-sized page to each individual student, where they provide a photograph of themselves (typically in the PRISM-embroidered laboratory coat), a short biography of what drew them to STEM, and then an abstract of their research. These texts are circulated widely and can be used by the students as evidence of their performance for graduate school and employment applications. Similarly, the annual symposium celebrates the accomplishments of all undergraduate researchers by providing a conference event that allows students to demonstrate their knowledge and scientific communication skills in an authentic setting. PRISM provides preparation for the symposium, including scientific poster workshops, public speaking rehearsals, and free printing of the students' finished, full-color scientific posters.

Entwined in all of these activities are scaffolded academic supports provided by the program: workshops on research skills, how to write the PRISM research proposal, effective scientific presentation for conferences, presenting research in scientific posters, and using scholarly databases to find scholarly articles. Guidance is provided for finding and applying to external summer research opportunities. For students nearing graduation and interested in applying to graduate school, assistance is offered in preparing for the MCAT and GRE as well as in composing personal statements and resumes for medical and graduate school. In some instances, students are assisted in finding financial supports to offset some of the costs involved.

In addition to these programmatic supports and one-on-one relationships between mentors and mentees, where reinforcing belonging and articulating disciplinary expectations objectively is key, students are also encouraged to participate

in conferences such as the Annual Biomedical Research Conference for Minority Students (ABRCMS; now the Annual Biomedical Research Conference for Minoritized Scholars) and the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS). Conferences like ABRCMS and SACNAS are not only places where students can meet peers from across the nation and build personal networks but are also important professionalization opportunities that afford a space to secure internships and postgraduate opportunities with institutions and individuals who *actively value* a diverse STEM workforce. They bring representation to a new level. When people are minoritized within a specific space, having meaningful others who understand (and will not try to explain away) their lived experience is critical.

Actively, programmatically engaging with narrative identity work is a critical aspect of building inclusive STEM spaces because it serves as an external force to disrupt traditional ideological views of who belongs in STEM disciplines. It physically manifests alternatives to the "white male template" (Thomas, 2017) that permeates these spaces. By actualizing a space where historically marginalized students can see and hear themselves being represented and can learn about individuals like them who have contributed to their fields, educators create a space where students can turn toward potential futures and orient as members of the disciplinary community.

Discipline as a Cultural Artifact

Structurally, PRISM works to fill the gaps and offer support in areas typically assumed to be part of an achievement gap. Yet, in my work with the six student participants in this study, it became clear that academic supports and representation were not the complete solution to closing the opportunity gap in STEM education. The pedagogy and curriculum was also critical—particularly being taught to step back and see the discipline as a cultural artifact to be examined and challenged. Helping students enter a space without consciously and critically examining the ways in which the spaces have historically kept them out only sets underrepresented students up for failure.

The idea of curriculum and discourse as culture is not new. As Michael Vavrus (2008) has explained, "traditional curricular and instructional methods. . . have often been ineffective for students of color, immigrant children, and students from lower socioeconomic families" due to the curricular and institutional privileging of White, middle-class values and expectations (p. 49). As a result, pedagogical approaches such as culturally responsive pedagogy and antiracist pedagogy that take into account the cultural backgrounds and life experiences of students in the classroom through the acknowledgment and infusion of their backgrounds into the curriculum have evolved.

When students encounter a new discipline as novices, they are often intimidated by its culture. They are intimidated by the reading and writing practices,

the discourse (which includes language and jargon), the methodologies used, the valuing of information, and (in some cases) the lack of representation they see of people who look and sound like them. For those in undergraduate research, there is the additional pressure of fear of failure and disappointing someone in a position of power (i.e., their mentor). At the start of her undergraduate research experience, for example, Chloe's anxieties about the work of the laboratory were particularly high. Though she had some experience with scientific writing in her courses, she recognized that the writing expected of her in her research experience would be quite different. "Hard," was how she described it when asked what she was expecting. "Writing in such a specific way. . . . You know, it just sounds like such a difficult process." As a first-generation college student from a lower socioeconomic background, Chloe was acutely aware of the language differences between her home discourse and the discourses of both college and science. "Everything in science," she explained, "has to be super, super specific and in a very specific order." "It's college," she would say whenever she was asked about the difficulty level of the reading and writing, acknowledging that the ways of communication in that space were far different from those used in her home social circles and also suggesting that true discursive skill in science was a long way out of her reach.

Ruben's orientation to scientific discourse was similar at the start of his research experience. He quickly learned that the "style that you have to use" was not what he had been taught in his coursework. Ruben was negotiating multiple discourse communities on a daily basis: at home, he and his family spoke Spanish exclusively; on the construction site, it was a combination of both English and Spanish in an informal working-class banter; in his courses, the discourse was more formal and academic; in the laboratory, the language was jargon-filled and specific to analytical chemistry. Attached to each of those discourses were specific ways of thinking and knowing and different rules of participation that quickly became evident.

The advantage that both Chloe and Ruben had in these early stages of undergraduate research was that they had mentors (Latinx women themselves) who recognized the culturally informed aspect of scientific discourse and, as such, were clear that this was new territory each student was entering. The students participating in this study experienced a wide variety of language-positioning during their undergraduate research experience. Some mentors adopted a view that students would pick up the discourse through immersion over time; others took to teaching it explicitly, to various degrees. What I found through this study is that explicitly teaching the reading and writing practices of the discipline (what I refer to as "mentored writing") had powerful effects on both students' rhetorical skill and their identities as scientists.

The practice of mentored writing—writing that is not simply shared with a more experienced writer but that is explicitly directed—is not a new concept by any means. It is quite common, for example, to see creative writers working with

more seasoned writer and peer groups to workshop their writing in an effort to assess affect and experiment with rhetorical moves and form. This same practice undergirds much of writing center pedagogy, as well. However, in STEM disciplinary arenas, this is not as common a practice. The most successful mentors I observed had a strong awareness of their students' needs. Drs. Bianchi and Martinez, in particular, were exceptional at this and had developed an explicit, scaffolded approach to teaching the genres, rhetorical conventions, and critical reading necessary to successfully engage with others as a scientist—and they did so without hampering their research progress.

This scaffolding began with reading practices, providing students with selected articles meant to orient them to the research in which they will be involved. These articles included the mentors' own writing, which allowed the students to see how their mentors engaged with the community discursively. Importantly, the mentors discussed the readings with the students to ensure that they understood the context, learned how to identify important takeaways, and critically questioned the material. They also reinforced the recursive process of writing by talking about their own writing processes as well as telling students to revise data sheets from experiment to experiment and source new literature when new questions arose.

They read and commented on students' writing early and often, providing constructive feedback that drew attention to the disciplinary jargon, and they did so in such a way as to position the scientific discourse as another language, rather than some deficit in the student's knowledge base. Across all my research participants, when mentored writing was used as part of the research experience, students showed an improved understanding of genre purpose and conventions. Their ability to read and retain disciplinary knowledge from the primary literature increased. Importantly, the positioning of scientific discourse as a dialect of English to be learned, rather than something that should come naturally, allowed them to see communicating as a scientist as a code-switching activity rather than as the abandonment of their home discourse. This not only helped build rhetorical facility, but it also helped situate the students as insiders to the scientific community.

The ways in which mentors positioned the discourse and practices of their respective disciplines became an important factor in how students experienced and engaged with scientific discourse. When faculty mentors explicitly addressed the underrepresentation of BIPOC and women in science and created space for multiple identities to exist and intersect, they created a space where students who identified as members of racial or gender minority groups could see clearly that this underrepresentation is not correlated to some biological factor but has really been about access and erasure. When they did not recognize this historical positioning, students often interpreted their struggles as deficits within themselves.

Explicitly talking about these realities also helped to counteract the imposter syndrome that presented itself quite a bit for students in the early stages when they

sensed that they were being given something just *because* they were a minority, not because they earned it. One exciting finding of this research that related to explicitly addressing disciplinary culture and history was that many students began to see their difference as power. They recognized that their social positioning provided them with a unique lens through which to view their work—viewpoints that represented large gaps in the field. In our final conversation, for example, Anne explained that her experience as a Black woman from a low-income family gave her agency within her home community and empowered her to pursue lines of research that were to date underexplored (maternal death rates for Black women). Something as simple as talking about the discipline's culture seemed to have powerful effects on students' self-concepts as STEM practitioners.

Direct Relational Transactions: Planning for Mentor Fit

The most profound impact UREs have in moving toward a counterspace relates to direct relational transactions, in which students have "a community of others who can empathize with their experiences, reducing alienation and exclusion" (Case & Hunter, 2012, p. 266). Building an understanding with peers and mentors of what it means to be a successful female and/or BIPOC scientist was critical in building self-efficacy for students in this study. Elsewhere in this book, I have placed strong emphasis on representation: the need for students to see people in positions of power who look and sound like them. Now, I would like to complicate that notion slightly. In the context of mentoring, fit is far more extensive than mentors and mentees sharing a similarity (for example, a shared area of study or interest, a shared gender or other demographic). As Vicki L. Baker and her coauthors (2014) note, "Fit is achieved through the presence of shared values, complementarity, and mutuality" (p. 84). Both the mentor and mentee must have a common goal and means to achieve that goal; each plays a role that benefits the relationship, and each offers something to the other. In short, fit is bidirectional, not unidirectional.

While fit has been of great concern to scholars working in organizational and management realms, it has largely focused on employer-employee relations and influence on productivity. But we know mentors play a *different* role than supervisors in the lives of students, and thus the mentor-mentee relationship requires "a different understanding of fit" Baker et al., 2014, p. 84). Those matching mentors with mentees need to take into account how the mentor views the relationship (including their expectations), how the student views the relationship, and where there is agreement and dissonance.

For example, it is not uncommon for students to enter the undergraduate research experience with an expectation that the experience will be akin to a directed study. They believe their mentors will spend time guiding them through the stages of research, telling them what to read, telling them when and what to write, etc. Those students enter with a specific set of assumptions and expectations.

Similarly, it is not uncommon for mentors to have eight to ten other students working in their labs whom they expect to onboard the new students. As discussed previously, some mentors also believe that it is the students' duty to seek out scholarly literature related to the lab work and then propose a topic for research. These mentors' assumptions are that the students enter knowing that this needs to be done as well as how to do it.

In these instances, there is an enormous dissonance between the students and mentors. Depending on individuals' prior experiences as learners and teachers, they could begin to unintentionally make assumptions about one another. The mentors might find themselves saying, "This student is underprepared for research, so I need to give them simple tasks." Or, "This student isn't invested in the work." The students might think, "My mentor treats me like a child. I'm just a benchwarmer." Or, worse, "I don't think I belong here."

When mentors and mentees do not fit because of expectations and pedagogy, it can tear at the students' identities and reinforce the belief that they do not belong because, when students "fail" or fail to meet mentors' expectations, that failure often becomes internalized as evidence that they do not belong. Students do not necessarily recognize "failure" as simply not yet possessing the necessary skills to thrive within the undergraduate research context.

As mentors and faculty, we have a responsibility to make sure that our expectations and pedagogy are appropriate for the students working with us in undergraduate research and in our classroom settings. It is up to us to let students know outright what it will look like to work with us in research or to be in our classrooms, and it is up to us to decide whether we will alter our practices for a particular student when our default pedagogy may not seem to be working. Administrators of programs also have a role in helping students find mentors who are appropriate to their learning needs. It is not always about what subject of study the mentors examine or what gender or ethnicity they are, though if those can also be accommodated, all the better.

Providing Space for Resistance

Resistance—pushing back against—can look like problematic behavior when not viewed in full context. Ruben, as discussed in Chapter 4, resisted scientific discourse when he struggled to see a place for himself in the field. To his mentor, he looked disinterested and "checked out," but in many ways he was enacting resistance, making a concerted effort to not be changed by oppressive conditions (Case & Hunter, 2012, p. 259). In fields that are historically exclusionary, having a space to safely challenge discourse and behaviors that are experienced as oppressive is critical.

As noted earlier, one of the ways that STEM education is both critiqued and made accessible to students is through accepted uses of language. The Spanish-speaking students in this study felt as comfortable engaging with one another,

mentors, and administrators in Spanish as they did in English. PRISM has taken steps to include Latinx communities by translating public-facing materials that may be read by families and friends outside of the college community (e.g., the invitation to the PRISM symposium). Equally common to hear in the laboratories and hallways are students speaking African American Vernacular English. Though seemingly a small act, speaking a language other than Academic English in STEM settings can be seen as an act of resistance to the English-dominated discourse.

Other areas where the culture of PRISM pushed against the norms were the inclusion of women and family. In academia broadly, and in STEM disciplines specifically, there is a strong push for women to put career before family (i.e., not get pregnant). Should women have children, they are expected to keep those children hidden so as not to be distracting (Barth et al., 2016; Economou, 2014; Plevkova et al., 2020). The faculty mentors (male and female) in PRISM, however, did not adhere to such rules. During this study, multiple female mentors became pregnant and embraced and celebrated their new family additions. Students in my study—particularly the female students—remarked that it was encouraging to see how a professional scientist could juggle the physical challenges of pregnancy with the rigor of laboratory work. When one laboratory had to cancel a trip to a conference due to the potential for exposure to Zika virus, students did not feel frustrated or inconvenienced. Instead, they worked to find an alternative opportunity and repurpose the abstracts and research for a conference closer to home. Further, it is not uncommon for students in laboratories to know their mentor's children and occasionally see them in the department. This familial, communal approach directly counteracted the narrative of scientists living and working alone with no time for a meaningful personal life.

Conclusion and Applications

The undergraduate research space is one where worlds, cultures, languages, and experiences come in contact with one another. Unlike Mary Louise Pratt's (1991) "contact zones," however, where cultures "meet, clash, and grapple with each other, often in contexts of highly asymmetrical relations of power" (p. 34), PRISM works actively to diffuse the tensions that may result from differences related to race/ethnicity, gender, socioeconomic status, and prior knowledge. While not perfect in its execution, using the URE space to allow power and disciplinary negotiations to take place creates an opportunity for students and faculty in PRISM to form affinity groups, build relationships, and create narratives that increase inclusion and accountability. During my study, the URE functioned as a safe space where minoritized individuals could counter dominant narratives of oppression prevalent in STEM disciplines and prevalent throughout their whole lives.

While it may not always be possible to address *all* of these mechanisms in a classroom, laboratory, or program, there are ways that educators and mentors

can enact them on a smaller scale. Narrative identity work is about ensuring that students see themselves in the space they are attempting to enter. This includes representation in the educators and practitioners that they encounter, but it also means that their identities are represented in the texts and ideas encountered. As I noted in Chapter 2, Chloe's mention of learning briefly in one class about Rosalind Franklin's contribution to identifying the structure of DNA is insufficient. Educators should actively ask themselves about what gets privileged in their courses, whose perspectives are included, and what they can do to include more diverse voices.

Similarly, it is important that educators help students see the connections between community and language. Teaching students that the ways in which individuals communicate in analytical chemistry will differ from how they communicate in forensic entomology is a simple, yet powerful, way to help students orient to their fields. Providing explicit instruction on the rhetorical moves common to a field not only points out the differences between fields but also provides students with models for their own writing and helps them begin to recognize patterns when encountering new research texts. Languaging practices are not universal, and students from underrepresented backgrounds benefit from having tools to decode texts (while students from dominant backgrounds have their eyes opened to the many other ways of communicating that exist and are valid).

Finally, creating space for resistance—and *expecting* resistance—from newcomers can be generative. In disciplines that ask practitioners to support ideas through empirical research and to test ideas rigorously, faculty members and mentors have to provide space for that critical lens to be applied to the historical practices and beliefs of their fields, as well. This might entail actions as simple as challenging the accepted norms of what scientists physically look like or how they speak and write about their research. It might mean reconsidering research methods or considering alternative ways of knowing. It should involve helping students see that their life experiences and cultural backgrounds are not in conflict with their new disciplinary identity and could lead to generative queries and perspectives. In whatever manner it is actualized, it is important to provide opportunities for newcomers to be able to actively critique the conditions in which they are living, learning, and working and to call out and name oppressive forces when they are present (Jocson, 2006).

In the next, final chapter, I take up the practical applications that come from this research. Through continued discussion of how counterspaces work, I highlight five areas where program administrators and faculty can immediately focus attention to make their STEM educational spaces more inclusive and accountable. These recommendations not only are meant to reduce obstacles for students but also are meant to be achievable for faculty new to this work. They serve as entry points, not full solutions unto themselves.