

Leading by example: developing mentoring strategies to promote diversity and student success

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ABSTRACT Research has shown that individuals from diverse backgrounds and women are underrepresented in the science, technology, engineering, and mathematics (STEM) fields. A lack of identifiable role models/mentorship and poor mentoring experiences are a few cited factors that continue to limit increased diversity. As an underrepresented individual and a faculty member at a minority-serving institution, I strive to provide my students with a strong example, one that they can identify with. Part of my approach has been to develop mentoring pillars and strategies that seek to build relationships with my mentees and that aim to improve their research experience. This essay briefly describes my experiences as a mentor and the mentoring pillars I developed to promote a diverse and inclusive environment for my current and future mentees.

Monitoring Editor
Veronica Segarra
High Point University

Received: Apr 21, 2021
Revised: Sep 13, 2021
Accepted: Sep 20, 2021

THE UNIVERSITY OF TEXAS EL PASO

I am an Associate Professor at The University of Texas at El Paso (UTEP). UTEP is a minority-serving institution (MSI) with both undergraduate and graduate programs. UTEP enrolls more than 25,000 students, with 83.7% undergraduates and 57.7% graduate students of Hispanic ethnicity. Most of the students at UTEP are financial aid (Pell grant) eligible, and 50.4% of college graduates were first generation in 2019–2020. UTEP sits at the US/Mexico border, serving students who cross the border daily to gain access to an education. UTEP is also an open-access public-serving institution whose demographics reflect the geographical demographics of the region. UTEP serves as a hub for providing on-campus research experiences, with 43.5% of graduating seniors in 2018–2019 reportedly having participated in some form of on-campus research. UTEP also has a faculty of approximately 50.3% women, with 23.5% of the faculty identifying as individuals from a diverse background (cumulative from African American, Asian, or multiethnic). In 2018, UTEP was classified as an R1 Doctoral University with Very High Research Activity from the Carnegie Classification of Institutions of Higher Education. Thus, UTEP provides research experiences to students from traditionally underrepresented (UR) backgrounds, students with limited socio-

economic resources, and a significant number of Mexican students seeking an education in the United States. From a mentoring perspective, the student demographics at UTEP requires a unique one-on-one mentoring approach because students are generally unfamiliar with research careers, research culture, and the resources available to them. Therefore, I developed my own set of mentoring pillars with the goal of providing students with a strong sense of belonging and self-efficacy. Both sense of belonging and self-efficacy, or the belief in one's abilities, have been shown to improve retention and academic achievement (Lent *et al.*, 1984; Brady *et al.*, 2020; Johnson *et al.*, 2020; Hoegen *et al.*, 2021). These mentoring pillars are as follows:

1. Set the tone through example.
2. Build a relationship (getting to know your student for who they are and where they come from).
3. Be responsive.
4. Provide students with access to and knowledge of diversity programs.
5. Be active in a mentee's diversity network.
6. Help mentees to find their own voice.

DOI:10.1091/mbc.E21-04-0199

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SET THE TONE THROUGH EXAMPLE

I am a Hispanic female, first-generation PhD from a disadvantaged background; therefore, the most essential aspect of my position is to provide students with an example of what can be obtained. I want them to look at me and realize that obtaining a PhD and a

career in science, technology, engineering, and mathematics (STEM) is within their grasp. This is sometimes difficult as data have shown that 40% of white undergraduates, as compared with 24% of UR undergraduates, successfully obtain a bachelor's degree in STEM fields (Hurtado *et al.*, 2009). Therefore, I use my actions to set the tone/culture of the lab. First, I provide all incoming students with an "expectations" document. The document answers common questions and provides the students with the basic day-to-day operations of the lab. I cover individual expectations and separate the expectations based on career stage. For example, the expectations for an undergraduate volunteer differ somewhat from the expectations of a graduate student or post-doctoral fellow. Basic expectations range from how to keep a scientific lab notebook, lab meeting attendance, equipment usage, and good etiquette. Practicing good etiquette is defined by basic principles that we all adhere to. These include 1) be responsive to email/SLACK messages, 2) respect each other's opinions/ideas, 3) be on time for meetings and contribute to lab meeting discussions, and 4) conduct your research and analysis with the highest ethical standards. Most important, encourage an open line of communication and be a "good citizen" in the lab. A good citizen helps to make lab reagents, keeps track of the inventory, organizes the lab, helps on lab projects, and respects everyone's opinion. Being a good citizen might also include taking on extra duties in the lab without being asked. For example, we use zebrafish as a model system and they require regular feedings, tank cleanings, genotyping, and monitoring the system alarms. We all contribute equally to these tasks, which limits the formation of any hierarchies and promotes inclusion and equality.

Second, I leave my ego at the door, to develop a team mentality where we learn from each other rather than using a top-down approach. This approach allows inclusivity and promotes an "inviting" environment, one that encourages people from all walks of life, no matter their career stage, to contribute to the overall ideas and directions of the lab. Using this approach has naturally led to the development of teams of individuals who work on the same project. The team approach allows my group, composed of individuals from different backgrounds and primarily of undergraduate and graduate students, to have a high level of success (manuscript publications, poster/oral presentations, fellowships, internships, etc.). As a team, we practice self-regulation, which can be defined as maintaining composure and not allowing personal feelings to dictate how we treat one another. For example, we all have bad days, but it is important that we do not allow those days to dictate our team interactions. This approach must start with the standard that I set. For example, I commit to both the consideration of my students' ideas and their implementation. Implementation provides the best form of recognition. One example of my adopting one of my students' ideas relates to changes we have made to the way we track and log our zebrafish colony. And while I make individual mistakes, the response I have to my own mistakes affects the response of my students. It is hard not to notice that when I have a bad day, it bleeds into my students having a bad day. I adopted the "do as I do" mantra, and I am careful in my personal reactions. My reactions not only set a standard for the lab but more importantly, provide an identifiable example of how my students should carry themselves.

BUILD A RELATIONSHIP

As an open-access MSI institution, students from all backgrounds are welcomed and recruited to UTEP. Therefore, to create a sense of belonging, my mentoring strategy seeks to build a personal

relationship with each student. To do so effectively, I limit the total number of mentees I have at any given time so that I can spend sufficient time with each of them. I try to learn about the challenges that my students encounter, where their education fits in, whether they are first-generation students, single parents, or have family obligations at home. I share my own experiences to provide my students with an example of my path or the challenges we seek to overcome.

BE RESPONSIVE

One of the easiest ways to build a relationship with my students is to stay engaged. I guarantee the following:

1. I will respond to emails within 24 hours.
2. I will advocate on behalf of students.
3. I will submit feedback to them on any written or oral products within 2 weeks.
4. I will meet with them at their discretion as far as my schedule permits.
5. I will follow up with them on experiments and data analysis when required.
6. I will write letters of recommendation and submit them by the due date.
7. I will work to help each mentee secure funding and meet major degree/scientific milestones.
8. I will be available on the laboratory SLACK channel from 8 am to 7 pm.

PROVIDE STUDENTS WITH ACCESS TO DIVERSITY PROGRAMS

As a first-generation college student and the first in my family to earn a PhD, I was initially unaware of the UR toolbox available to me. By the stroke of luck, I became part of the Minority Access to Research Careers (MARC) (Maximizing Access to Research Careers Awards [T34]). The MARC program sought me out, ultimately changing the trajectory of my life and career. As a mentor, it is important to provide mentees an awareness of programs such as MARC, the Initiative to Maximize Student Diversity (IMSD) (Initiative for Maximizing Student Development Program [T32]), the Research Initiative for Scientific Enhancement (RISE) (Research Training Initiative for Student Enhancement Program), T32 training grants (Program Details|Research Training and Career Development), diversity grants including the F31/F32 training fellowships (Individual Fellowships|Research Training and Career Development), and career development awards (Research Career Development Awards|Research Training and Career Development). It is a mentor's responsibility to discuss these types of programs with students, what they can expect, what the advantages and disadvantages are, and how we can use them together to meet their goals. Most of these programs provide students with stipends and tuition support. In fact, at UTEP, we have had active MARC, RISE, BUILDing Scholars (Building Infrastructure Leading to Diversity [BUILD] Initiative), and Bridges to the Baccalaureate programs (Bridges to the Baccalaureate Research Training Program [T34]). These programs have not only opened opportunities for individuals to have research experiences in the STEM fields, but more importantly have had a tremendous impact on retention and academic success for participants. As a faculty member, I am committed to participating in these active programs and foresee myself having a major role in such programs during my career.

BE ACTIVE IN A MENTEE'S DIVERSITY NETWORK

Early in my career I was shy and slow to interact in a group. But sharing your science and personal experiences is an important skill and having a professional network for emotional and professional support is important. Such a network takes time to develop and is distinct from a diversity network. A diversity network is a group of your peers, primarily from UR backgrounds, that you can go to for support and understanding. My diversity network has been formed through society-specific programs or programs that bring UR scientists together for training opportunities. Some examples include the Faculty Research and Education Development (FRED) (Grant Writing Training) from the American Society for Cell Biology and the Mentoring Initiative for Neuroscience Diversity Scholars (MINDS) program. These programs are funded by the National Science Foundation and the National Institutes of Health, respectively, and both provide a year-long mentored experience for junior faculty or advanced postdoctoral fellows. These programs provide grant writing training and professional development, but also help you to develop a professional diversity network of collaborators and colleagues. Many of my current mentees have applied to stage-specific programs as one approach toward building a diversity network.

HELP MENTEES TO FIND THEIR OWN VOICE

Finding your own voice as a mentee can be very difficult. I encourage all my mentees to check their shyness at the door. I recommend that they sit at the front of the class/seminar and use every opportunity to ask questions. Asking questions helps them to become known, challenges them to think critically, and reduces fear and anxiety in other settings such as a poster or oral presentation. It is important for them to put their ideas out there and learn to treat criticism as an opportunity. I encourage my mentees, regardless of career stage, to present at local, regional, and national meetings. Thankfully, our department and university have done a fantastic job of supplementing student travel funds, which has provided many of my students the opportunity to network and gain oral communication skills.

CONCLUSION

Research has shown that students gain a science identity and increase efficacy in science if they are provided a high-quality research experience (Estrada *et al.*, 2018). This is particularly important for UR groups (Salto *et al.*, 2014; Bruthers and Matyas, 2020) because the perception of a mentor or the overall research experience can be predictive of future academic outcomes (Byars-Winston *et al.*, 2015). Literature has established that many mentees report negative mentoring experiences (Limeri *et al.*, 2019). These data suggest that mentoring can have lasting effects on the success and self-perception of mentees. Many mentoring approaches have been well documented in the literature and require mentors to play many different roles, with each role having its own set of guidelines (Pfund *et al.*, 2016; Clement *et al.*, 2020). I have used my experience and background to develop six mentoring pillars. Each is designed to build a positive working relationship that promotes life-long learning. These pillars are designed to decrease absenteeism, negate a feeling of lack of support, and ensure that all mentees are aware of my expectations from the beginning of our working relationship. These pillars are in no way complete. I have and will continue to adapt them based on mentee experience and feedback. However, it is my hope that enacting them allows students the opportunity for a positive mentoring experience that they find truly enriching.

MEET THE AUTHOR



I am an Associate Professor at The University of Texas El Paso in the Department of Biological Sciences. I graduated in 2005 from New Mexico State University with a BS in Microbiology and earned a PhD in Biomedical Sciences from the University of New Mexico in 2010. I was trained in developmental biology and human genetics at St. Jude Children's Research Hospital and The University of Colorado, School of Medicine, Anschutz Medical Campus. My current research focuses on understanding the underlying mechanisms that cause neurodevelopmental phenotypes associated with rare multiple congenital anomaly syndromes. I am enthusiastic about teaching/mentoring and enjoy the opportunity to work one-on-one with all my trainees.

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