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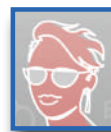
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Physics from an Underrepresented Lens: What I Wish Others Knew

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This image signals that this contribution is a featured part of the special collection on “Sex, Gender, and Physics Teaching.”

In this paper, I (SH) will apply a counter-storytelling method¹ to highlight a perspective that is not often present in the physics culture. The counter-storytelling (or counter-narrative) method gives voice to people from traditionally marginalized groups to share their untold experiences. Counter-storytelling, as the name implies, challenges common social views and ideas, and, in this paper, highlights the need for changes in the current physics culture. At a young age, I was never encouraged to go into a STEM field. I have always leaned more towards math and science, but I never thought of a science-related career until my sister inspired me in high school. I later realized that in STEM fields, people can let their imaginations run wild, making new observations and discoveries every day. And yet, amid pursuing these wonderful opportunities, individuals from groups underrepresented in STEM fields face challenging situations imposed by those surrounding them in the field. My physics instructor once told me that some people have their lives set on a more difficult mode than others because of their background and identities. As a Latina student whose family is from México, I have come to know an unfortunate truth: my gender, ethnicity, cultural background, and status create barriers for me. This has been the case throughout my life, but most especially in my journey pursuing an undergraduate STEM degree. Because of this, I want others to know my challenging experiences in education and how they have affected me. By sharing my story, I hope to encourage others to work for change in the STEM fields and in the classroom.

My voice is not valued, heard, or recognized in STEM classes

I was the only woman and only Latinx person for two quarters in my 200-level engineering courses at my community college. Even with five to seven students in each class, being the only woman still made me feel like I did not belong. When we were put into groups for the first time, a groupmate said to me, “It wasn’t hard to find you. You stick out because you’re the only girl.” Throughout the whole first quarter, I felt so much pressure to be “very smart” or else my voice and my ideas would be ignored. This seemed in stark contrast to my other classmates’ experiences—it seemed that regardless of what my other classmates said, they would always be heard. I did not matter.

In all of my STEM classes, I often give my opinion and ideas during group activities, and I do not get so much as a glance in response. At first, I thought I was being ignored because of my speech; I often qualify my ideas with “maybe we should...” or “what if...?” But I am a strong student—my ideas are generally productive and insightful, and they are often aligned with information given later by the instructors. However, even though my ideas were consistently reinforced,

I continued to be ignored in small group work when engaging with other students.

I gradually concluded that I was experiencing microaggressions—acts that denigrate the people of specific groups. This is consistent with research. Barthelemy et al.² adapts and identifies many subthemes of microaggressions from Sue and colleagues³ that are relevant to the field of physics and to my experiences. In the instances where I’m being ignored, I am experiencing the microaggression subtheme of “invisibility.” These people in my classes (mostly men) treated me like a ghost, as if I never said anything. In physics class, I once told a groupmate of mine what I thought the next step to solving the problem should be, and he paused for a couple seconds then continued writing without saying a word or even looking at me. My groupmates would often ask questions among themselves about the problems, but never extended the conversation to me.

Being excluded from group discussions was not the only problem. When my comments or questions were addressed, I felt talked down to and belittled. When my ideas are not taken up or valued, I experience a microaggression subtheme called an “assumption of inferiority.”² There was a time when one male classmate shoved back his chair violently and raised his voice. He told me I was doing the problem wrong, when in fact I was right. The instructor witnessed the event and unfortunately did nothing. Regardless of what ideas one may have, every student’s ideas should be valued and respected.

Already feeling like you do not belong is tough, but I do not know if I sometimes get this treatment because I am young, quiet, female, or even because of my cultural background. I thought maybe I had to change my strategy for getting my ideas recognized by becoming more outspoken or calling out when I was being ignored. However, in describing my experiences here, the second author of this paper (IM) shared a contrasting story. She is another female student of color who confidently shares her ideas during group work. Yet, in her computer science class, when she had to raise her voice to ask why her ideas were not being explored, the male classmate leading the group conversation raised his hand and said, “Chill, no need to get emotional; it’s just an idea.” Here, she was marginalized for showing emotion and her ideas were still discounted, in contrast with the male student in my class who got angry with me for attempting to share my idea at all. Regardless of whether we Women of Color use a timid or assertive approach to contribute, our ideas are disregarded. I remember going to my on-campus job right after situations like these happened and complaining to my coworkers, and they said, “That’s just how things are for women in STEM; I’m sorry.” However, things do not have to be this way, and no one should settle for this.

I am both objectified and expected to act in masculine ways

Sexist language is a part of my STEM classes. It makes me extremely uncomfortable how women in STEM are objectified and how their achievements and intelligence are disregarded. For example, my physics instructor organizes students into groups using a pack of cards with female scientists who have made significant contributions to the field. A classmate of mine remarked to the whole class about one of the female scientists as the “hottest” woman in the pack. This blatant “sexual objectification”² of women was in direct contrast to the goal of the cards: to celebrate the scientific accomplishments of those women. I and my female-identifying classmates were faced with processing that microaggression while learning physics. This may seem out of the ordinary, but it is common for women to be acknowledged and even harassed in STEM classes just for their appearance. In these situations, I always want to stand up for women, but because it can be intimidating, I find myself unsure of what to say and how to say it.

Barthelemy et al.² shared that these experiences continue into graduate school, where female participants described that they would dress in a more masculine way, wear glasses, and pull their hair back if they wanted to be taken more seriously. I believe women in STEM can also lose a bit of their identity and femininity because they want to fit in with the STEM culture, which is dominated by white men.⁴ Although I should be able to confidently wear what I like, I have had to suppress my feminine characteristics and appearance to not cause too much of a distraction or not get the wrong attention of men in the classroom. I should not feel like I must suppress the real me to fit into this culture.

I have to fight against my own subconscious thoughts – created by structural racism and sexism

I have also experienced stereotype threat many times in the classroom.⁵ Being part of two underrepresented groups in STEM has almost made me twice as conscious of my identity. Because of the intersectionality of my ethnicity and gender,^{6,7} sharing my ideas with the class is intimidating and difficult. I always need to prove my classmates wrong in my subconscious thoughts—to prove that women and Latinx people are more than capable of providing correct answers and valid ideas. Keeping this in my mind and heart has, in a way, not allowed me to properly form my thoughts and speak out. I am afraid of saying the wrong thing and disappointing those whom I represent, and allowing a false and negative image of them form in others’ minds.

My role models are mostly white men. Do I belong?

Aside from my experiences with classmates, additional barriers have made my path to obtaining a STEM degree difficult. One of these barriers includes not feeling represented by faculty and being able to relate to their background and story.

Although I was fortunate enough to have two female physics instructors, there are generally not many women teaching STEM subjects. I have also never had a Latinx instructor in any of my STEM classes, and sometimes I cannot help but feel that maybe it is because we do not belong there. The majority of my instructors have been white males, and although I am grateful for those who have supported me throughout my journey, I would love to see more diversity among faculty members and be able to connect with and relate to them.

Instructors need to change the environment

My interest and passion for engineering has grown over the years through experiences and support offered to me by my instructors, family, and friends. After taking a couple of 200-level engineering courses and enjoying the material, I knew I wanted to do this work in the future. Some experiences supported my learning and goals while others did not. The classroom environment has not always been inclusive, but it has not yet made me want to change my goal of becoming an engineer. Unfortunately, it might make others change their STEM goals.

The first step in making your classroom, and ultimately the STEM field, more welcoming and supportive is to understand and explicitly call out that there is a problem with the lack of diversity in STEM. Many students from underrepresented groups including women feel like they do not belong.⁸ This feeling keeps students from participating in the classroom and even causes some to leave the STEM field.

Faculty can implement many actions in the classroom to encourage a more inclusive environment, thereby creating a nurturing place for all students to learn and grow.

- 1. Tell your students diversity is important.** All students should value and understand the importance of diversity. A team of individuals with different identities and backgrounds is very likely to produce diverse ideas. We hope that if students understand this, they will value others’ opinions more and not ignore certain group members.⁹
- 2. Give your students resources to understand the underrepresentation and inclusion problem.** Ask your students and even coworkers to read articles on diversity in STEM and stories of students who feel marginalized in this field (e.g., work by Chanda Prescod-Weinstein¹⁰). One source for this type of material is the Underrepresentation Curriculum.^{11–13} Learning about everyday interactions in STEM classrooms from the point of view of students in marginalized groups is eye-opening.
- 3. Emphasize forming a community and valuing others.** As instructors, you can encourage students to be more inclusive and when working in groups remind students to ask for and listen to the opinion of all their groupmates. Quiet students do not always have nothing to say, and if you see students who are marginalizing others in any way, approach the group and remind them that

everyone's ideas are valid. This sense of community influences the scientific career choices of Women of Color.¹⁴

4. Remind students that they can learn from each other. There is nothing like having someone who is in a similar position and mindset as you explain a concept in the way they understood it. All students can benefit from the knowledge of their peers. If students understand this, it encourages them to reach out to their classmates, including the students who feel left out.

5. Reach out to underrepresented students directly. My physics instructor in the first quarter of the calculus-based physics series reached out to the female students in class to let us know that she believes we can thrive in the classroom and we have her support. This was very impactful for me. Reach out to students who seem disconnected, particularly the students from groups underrepresented in STEM like myself, and let them know they have your support as their instructor and that you believe in their success. It can be hard to do in a large classroom, but even sending an email can be extremely encouraging. The American Physical Society National Mentoring Community (<https://www.aps.org/programs/minorities/nmc/>) offers resources and support to instructors and students who would like guidance about productive mentoring processes. As a student, knowing you have the support of your instructor means so much and greatly impacts your performance in the class.

As a Latina student pursuing a career in the STEM field, I attend classes where I do not feel represented and do not completely fit in the community. I want instructors to know that there are barriers and unwelcoming environments, especially in classrooms, for groups underrepresented in STEM like myself. I have been lucky. Although I highlighted the negative experiences, I have had many wonderful group experiences. Many of my friends, family, classmates, and instructors have encouraged me to keep fighting for my dream, regardless of what I might face at school and in the field. I have not yet completed my education, and I hope to see the culture change both for myself and for those following behind me. I know I can make it. Unfortunately, many students do not have the extra support that I have had, and this may keep them from furthering their journey in STEM. I believe that each of us has the power to change the dynamics in the classroom and field. For those people from marginalized and systemically oppressed groups, consider speaking out about your stories and experiences. This supports others and increases awareness of the inequalities we face. For those who have not faced these barriers, you have the power to take the actions described above and join our efforts in creating a diverse, inclusive field.

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