

Belonging, success, access, and disruption: Physics faculty goals for inclusive learning environments

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In interviews about efforts to create inclusive departmental and instructional practices, physics faculty express a number of different goals for inclusion. These goals include: students feeling welcome or successful, students having access to physics culture and practices, and faculty disrupting existing systems of oppression that permeate physics classroom spaces. Throughout their interviews, faculty name a number of practices that serve each goal. Some of these goals and associated practices focus on the interpersonal and individual, serving to ensure fairness and hospitality, whereas other goals and practices overtly acknowledge the systemic marginalization of women and people of color in physics, framing physics education as an opportunity to disrupt such systems.

I. INTRODUCTION

In order to understand physics faculty goals for creating inclusive learning environments, we interviewed eighteen college and university physics faculty that identify as caring about equity, inviting them to describe what they are doing in their classrooms and departments that is meant to support women and people of color in physics. In this paper, we describe one emergent finding: that faculty often attribute different meanings to “inclusive” and “inclusive learning environments,” and so articulate different goals in this context, which are then related to different classroom and departmental practices. Some of these goals and practices focus on the individual or interpersonal. Such goals and practices are intended to ensure fairness and hospitality; *i.e.*, faculty emphasized creating classroom and departmental spaces where all students can feel welcome and be successful. Other goals and practices address the systemic marginalization of women and people of color in physics; *i.e.*, faculty frame physics education as an opportunity to critically disrupt historic marginalization. These goals imply different understandings of how to create inclusive learning environments: (a) efforts on the interpersonal level to extend welcome and hospitality to every student or (b) acknowledgment that there are historic, systemic, and exclusionary forces at work in physics that need to be addressed before we can have a space where everyone is included.

Our aim in this paper is to make visible these differences in order to support conversation about inclusion in the PER community. Efforts to make physics and physics teaching and learning, writ large, more inclusive call for collective solutions. However, collective solutions require collaborative action, and collaborative action calls for shared understandings of terms such as “inclusive.” Without such shared understandings, participants can easily become frustrated and struggle to make progress. In the interviews conducted for this study, all of the faculty identify as caring about and working toward a more inclusive future for physics, yet have very different understandings of what that future looks like and how to get there. Identifying some of

these understandings may be a first step toward working together in the service of a collective solution.

II. METHODS

The four goals for inclusive physics learning environments that we lay out in Section III, and the practices we associate with each one, were identified from interviews we conducted with college and university physics faculty. Eighteen faculty participated in interviews with ADR, WTH, or RES (authors) about their efforts to create inclusive physics learning environments. These faculty were identified via a national survey sent out by the American Physical Society and by connections in the authors’ extended professional network; all faculty who participated either identified themselves or were identified by others as caring about equity in physics. Eight participants self-identified as female or women, and ten self-identified as male. Two participants self-identified as Indian or South Asian; one as African American; one as both Middle Eastern and White; one as Latina; and thirteen as white, Caucasian, or Anglo. All of the names in this paper are pseudonyms.

Interviews were conducted in two rounds. Six faculty participated in round one and were asked about (1) the gender and racial or ethnic makeup of their courses/departments; (2) how they think gender/race/ethnicity affects physics learning or progress through a physics degree (if at all); (3) how their goal of supporting women and people of color shows in their instruction or departmental practices; and (4) why they care about gender/racial/ethnic diversity in physics. Faculty could answer either questions about their instruction, departmental policies, or both. Twelve faculty participated in round two, approximately one year later. Round two’s protocol removed question 1, which was instead asked in a pre-survey, and included two additional questions that were meant to explore faculty ideas and experiences about inclusive learning: (a) what would it mean to them for a physics learning environment to be inclusive and (b) whether they have had any significant experiences that influence their thinking about women and people of color in physics. Question (a) was asked before questions 2

through 4, and question (b) was interspersed within. Interviews were semi-structured, with questions serving as a guide, not a strict protocol.

As we sought to characterize the inclusive practices that faculty named, we noticed that different practices seemed to be serving different goals for inclusive physics learning. To test this hypothesis, we looked within interviews for plausible connections between (a) overtly-stated definitions for “inclusion” and/or explicitly-articulated goals served by faculty efforts and (b) the inclusive practices faculty named. For example, when a faculty member said, “It’s just...we wanted a program where every student would succeed,” and then narrated specific practices as in the service of “giv[ing students] opportunities to excel in their research,” we considered those practices as plausibly supporting the goal of “all students being successful.” The purpose of this paper is to illustrate that there are different goals for, meanings of, and practices that serve inclusion among physics faculty. We do not seek to comprehensively or even representatively capture the full substance of our interviews.

III. PHYSICS FACULTY GOALS FOR INCLUSIVE LEARNING ENVIRONMENTS

In this section, we describe four of the goals that faculty named for creating inclusive physics learning environments, and we highlight instructional and departmental practices that were identified by faculty and that we see as enacting or connecting to these goals. These goals are not mutually exclusive: several faculty articulated more than one goal in the course of their interviews. Nor are the practices limited to supporting a single goal: a number of the inclusive practices that faculty described could conceivably support multiple goals for inclusion. In every case, the goals, practices, and faculty quotes are meant to illustrate, not comprehensively represent, the possibilities.

A. I want all students to feel welcome in my class/department.

One goal that was articulated by faculty in response to questions about what inclusion means, or about what they are doing to create inclusive classroom or departmental spaces, was that all students would feel welcome in their class or department. For example, when asked what it means to him for a physics learning environment to be inclusive, Andrew responded, “My first response is that everyone feels comfortable and welcome there.” Another faculty member, Ernesto, used the words “non-discriminatory, accessible, welcoming, [and] tolerant” to describe an inclusive learning environment. A few lines later, Ernesto gave an example of what it looks like for a course to *not* feel inclusive, saying, “Let’s say you [teach] a course and the examples you use, the language you use, tends to be more leaning to a particular group. That might not be very welcoming for people who don’t feel included in that group.” In short, for Andrew,

Ernesto, and others, part of what makes a physics learning environment inclusive is that everyone feels welcome.

In elaborating on what they are doing to support women and people of color in their classes or departments, both Andrew and Ernesto named practices that plausibly support their goal of creating a welcoming environment. Andrew said that he is working to use gender-neutral phrases like “you all” instead of gendered phrases like “you guys;” that he is working to learn and pronounce his students’ names correctly; and that he asks students to “speak up” when they have been “cut off” by their group. Each of these practices could serve to support students in feeling known, seen, and cared for by Andrew. Ernesto described transforming “the environment, even the physical environment, [to be] more welcoming. For instance, we have an undergraduate room, it’s like a study room, where we’re trying to make it more transparent, literally more transparent and more accessible to all kinds of people.” We understand Ernesto to be linking the arrangement of and communication about the study room to the potential for students to feel welcome: transparent communication about its availability means that everyone knows they are welcome, and intentionality around design means that everyone can feel like they belong there.

B. I want all students to succeed in my class/department.

A number of faculty expressed the goal that “all of their students would be able to succeed” as a guiding principle in their efforts to transform their departments or courses. For example, in response to the question, “How does your goal of supporting women and people of color show in your departmental practices or in your instruction?,” Yusuf listed a number of practices and strategies and then reflected, “This is all common sense, I tell everyone...Even way, way back [when we were starting the program...], we didn’t have this idea that we have to have...lots of underrepresented students or this or that. It’s just...we wanted a program where every student would succeed...And still to this day, I view our program as [one] where we want everyone to be successful.”

Leading up to this, Yusuf listed several specific, layered practices within his program that plausibly support this goal. In particular, he described intentional recruitment of students that are going to “click with one another,” saying it would be advantageous to a prospective student’s admission if they are “nice” and disadvantageous if they show signs of the “rooted macho culture in physics.” He described mentoring practices centered on thriving and success, including (1) a structured mentoring program in which senior students advise junior students about whom they should take courses from and (2) overt suggestions that students should choose their research advisor based on the “fit” (*e.g.*, pay attention to whether the advisor “micro-manag[es] or doesn’t guide the students”). We hear Yusuf describing flexible, responsive, person-centered structures that are meant to “give [students] opportunities to excel in their research” and coursework.

C. I want all students to have access to physics culture.

Faculty also expressed the aspiration that all students would have access to physics culture and practices. Many of these faculty overtly acknowledged that existing norms in physics learning privilege certain ways of talking and being, creating barriers for some students; these faculty often depicted their efforts toward inclusion in terms of addressing or removing such barriers. For example, in answering the question, “How do you think that gender or race or ethnicity affects physics learning, if at all?,” Raj stated, “...So there is a kind of social capital that’s involved in being successful in a science classroom, and particularly a physics classroom. And that social capital is making it really easy to attain [success] if you grow up...looking in certain ways or with access to a certain kind of privilege.” In other words, Raj is arguing that students with certain lived histories or identity markers have accumulated a kind of social wealth, or capital [1], that paves the way for their success in the course. Raj described a number of practices that plausibly serve the purpose of giving access to all of his students, or to addressing barriers for participation for students who may not have already accumulated the social capital to which he refers in his quote. For example, he said that he “tr[ies] to make sure that we have a lot of hands-on lab experiences so that we actually have shared experiences that we can refer to, instead of ‘when you went to the beach.’” We hear Raj implying that going to the beach is an example of social capital for learning about waves, and we hear him suggesting that providing shared experiences to all of his students distributes that social capital more equitably.

Esther similarly highlighted physics instructional examples, like SUVs colliding, that give inequitable access to the physics content students are expected to learn. She also described physics classroom discourse practices that favor some students and create barriers for others. For example, answering the same question as Raj, Esther said, “I think a large part of what learning physics often means is learning to talk in the way that physicists talk. Not just vocabulary—arguing is a really big thing, and defending your argument and having good reasons. I think when it comes to gender and race and ethnicity, those are things that I would argue are socialized for white men as normal and are not socialized for other folks as normal. That’s a really big thing...you’re expected to learn.” She went on to connect this to what she does in her instruction, saying that the ways in which her class comes to consensus are “varied,” emphasizing not only “challeng[ing] each other” but also “build[ing] from each other.” She said that her “point there is to value ways of knowing that are more oriented to collaboration and community building and less about highlighting the individual and making oneself look stronger than others.”

In short, Raj, Esther, and others point to ways in which physics and physics teaching and learning embed values or assumptions—such as examples that assume shared experiences or particular ways of coming to consensus—that

privilege some students and create barriers for others. They describe practices that are meant to address these barriers and to facilitate equitable access for all of their students.

D. I want to disrupt existing systems of oppression in physics classroom spaces.

Some faculty were explicit about their goal of disrupting existing systems of oppression—such as sexism and racism—in physics classroom spaces, naming this as a specific motivation for at least some of the work they are doing in their departments and courses. These faculty expressed an awareness of the micro- and macro-aggressions that women and people of color experience both in the classroom and out [2]; some of them discussed ways in which they think the discipline of physics, and by extension, physics classroom spaces, amplify these aggressions.

For example, Cate connected a female student’s silence in her class to experiences Cate has had as a female scientist. She commented that when she first started thinking about equity in physics, she “was first just talking about the classroom stuff. But then, beyond that ...it just erodes these kids, you know. It erodes them if they’re women. It’s easier to just do what everybody wants you to do.” James, another physics faculty, reflected similarly, “I’m always trying to be aware in the back of my head of the issues that the underprivileged groups are going through and what they can experience so that I can try and mitigate a lot of those, and try and make sure that they’re not present in the classroom or minimize their presence.” Both Cate and James described instances when they have “called students out” for sexist comments or behavior. For example, James recounted an incident in a small course he taught, comprised of six male students and one female student. He described these students’ group dynamics as “for the most part...really, really good.” He went on to say that at one point in the course, when the students had just begun to work on a calculus problem, “the female student started to write down a suggestion on the whiteboard, and the male student just went, ‘Shush, I’m thinking.’” James said that he “could see [the student] doing that to anybody,” but that it was “so bad because...here she is trying to express an idea, and the woman gets shushed.” He described his response: “...so I just called out this student. I was like, ‘What was that? ‘Quiet, men are talking’? What’s going on here?’” Both Cate and James acknowledge that the lived realities of their female students and students of color are marked by the constant experience of micro- and macro-aggressions, and they express their efforts to create classroom spaces that disrupt this norm, by overtly narrating sexist and racist behaviors as inappropriate and unwelcome.

Faculty also describe how they see physics culture augmenting experiences of exclusivity and aggression. For example, in responding to the question, “Why do you care about gender, racial, and ethnic diversity in physics?,” Anita said, “Because it’s incredible that we need to justify it. For

me it shouldn't be justified why do we need more women or more underrepresented groups. I feel [that] the fact that we keep asking that question shows the problem itself. The problem itself is that we have been normalizing 'this is an elite world of physics where only white men are the ones who are succeeding, therefore we need to justify why we need...more women and why we need...more Latinos.' Earlier, Anita described the "need to justify your existence in the world" as "the most painful piece that I always face." She named a number of practices from her own classroom that make women and people of color visible in the sciences, including data-based discussions of "who's studying STEM, who's graduating, who has access later." She also described a tool that she uses to engage students in recognizing who is dominant in conversation, saying that "even in female-dominated spaces you can hear the voices of the guys being stronger than the voices of the girls. So I bring in those conversations like, 'Let me figure this out. When I go around and I hear you working as a group, I hear mostly one voice. Why do you think that's happening, and how can we change this?'" In other words, Anita tries to make visible whose ideas are being elevated and heard—both in STEM professions and in her own course—and invite conversation around dominance and power.

IV. DISCUSSION

Physics faculty expressed a variety of goals for inclusive physics learning environments: that all students feel welcome, that all students be successful, that all students have access to physics culture, and that existing systems of oppression in physics classroom spaces be disrupted. They described a number of departmental and instructional practices that serve these goals, including being transparent about the availability of study rooms, supporting structured mentoring programs, shifting the ways in which consensus is built from competitive argumentation to collaborative sense-making, and calling out sexist or racist behaviors.

We suggested in the Introduction that these goals reflect different understandings of "inclusion" and "inclusive learning environments." In particular, goals tied to welcome and success focus on the interpersonal and individual: creating inclusive learning environments means extending welcome and hospitality to every student. Goals tied to access and disruption focus on systems and power: creating inclusive learning environments means acknowledging that physics, as a system, embeds practices and structures that center some and marginalize others, and these systems need to be disrupted before we can have a space where everyone

is included. These different understandings locate marginalization in different places. Interpersonal understandings of inclusion locate marginalization in the local and interactional, whereas systems-oriented understandings of inclusion locate marginalization in structures that are maintained by power. In locating marginalization in different places, these different understandings of inclusion call on faculty to act in different ways: to act as individuals and distribute local resources fairly (interpersonal) versus to act as part of a collective and disrupt the local culture of physics—thought of as a microcosm of a broader system—and reform the system writ large (systems-oriented).

We wrote this paper to make some of these differences visible, with the primary aim of supporting community conversation. We can imagine versions of a conversation about inclusion in physics in which participants become frustrated or do not make progress because we are using the same words to mean different things. Additionally, we want this paper to provide opportunities to think together about what we *want* inclusion to mean in our field and how we might act in service of a shared understanding. We (the authors) think that extreme versions of each of the interpersonal and systems-oriented understandings of inclusion risk something important, and that an approach that blends elements of both is likely to support progress. That is, we think extreme versions of the interpersonal understanding of inclusive learning environments risks limited material change for students who have been (and continue to be) *systemically* marginalized. Creating a local community in which students are told that they are welcome while *not* acknowledging that the *system* of physics embeds marginalizing values and assumptions risks reproducing those marginalizing values and assumptions. On the other hand, an overemphasis on collective action—and especially on immediate, disruptive action—may not hold individuals accountable to the kind of personal (and emotional) work that is needed to act from a grounded place [3]. The collective work of disrupting harm asks not only that we be intellectually committed to liberating ideas, but also come to terms with our own complicity in systems of oppression, so that we are able to act with conviction that we will *all* be liberated as we dismantle these systems.

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