

[NO AUDIO]

CATHY L.

DRENNAN:

So welcome everybody. I hope you're really excited about this semester coming up, and getting involved with teaching. So I am Professor Cathy Drennan, a professor here at MIT in the Chemistry and Biology Department. And I want to start today-- so this workshop is about stereotype, stereotype threat, wise criticism, unconscious bias.

And I want to start, because you're going to be teachers, with telling you about my motivation for doing this training. I think she's a chemist. Why is she standing up here telling us about this? So as teachers, it's good to tell your students about your motivation. So what is my motivation?

Well, my motivation was-- this a story from a number of years ago, and I was asked to attend a workshop happening at Harvard on increasing diversity in the sciences. And so when you went to register for this workshop they gave you a homework assignment. I thought that was interesting. So my homework assignment was to go to the chemistry department and interview all the undergraduates that were members of underrepresented minority groups.

And I discovered at the time, this was a number of years ago, there were two, and both of these students had transferred very recently to other departments. So that was not the best indication, but the students were very interested in talking to me. And I said, I want to hear about your experience. I want to think about what the department could do better. Again, this is an issue from the past. Things are a lot better right now.

So I met with these students, and one in particular was just really engaged with me. They're like, yes, I want to help you figure out what's going on, and talking about their experience, and thought a lot about what could have been different. And finally, came up with this thing, and he said, I never had a TA that believed in me.

And I just thought-- I was not expecting that response. Because I'd been working with TAs at that point for quite some time. And the TAs were really wonderful. They were engaged and excited. And I just thought, somehow the TAs-- there had been this disconnect. And I said, well, what did the TAs say to you? What happened?

And he thought about it and tried to come up with an example, and then realized, it wasn't

what they said, it was what they didn't say. And that just stuck with me. And I thought, his TAs probably had no idea that he was feeling this way. Here was this kid sitting in the classroom thinking, no one believes that I can do chemistry, and no one else was thinking that but him, probably.

So I said, we need to talk about this. We need to talk about how we can all have classrooms where everyone can reach their full potential. So that's what this training is about today. We're going to start this discussion, how do we create classrooms where everyone can reach their full potential, where no one's worried, sitting in there really worried, about what someone might be thinking about them.

So again, as a teacher, what I'd like to do starting out is give you the take home message. I like to give you the take-home message, tell you what I'm going to tell you, tell you the thing I'm going to tell you, and then tell you what I taught you. So there's a little bit of teacher training mixed in with this workshop as well.

All right, so take-home message. So the take-home message is that understanding stereotype threat and wise criticism is essential for being a good mentor, supervisor, and teacher, and helps with being a good human being, I think, as well. So that's the message. And you might think, OK, I'm buying in, but I have no idea what you're talking about with stereotype threat. So let's go there first.

All right. So let's look at some definitions. First, let's look at stereotype. So stereotype is a prevalent belief about a specific type of individuals or a way of doing things, which may or may not reflect reality. So most people can think of stereotypes. Stereotypes can be positive or negative. Most people think of negative stereotypes, but actually they can be positive.

So an example of a positive stereotype is that MIT students are smart. I've been here almost 20 years, MIT students are smart. That's a positive stereotype. Stereotypes can be based in truth. That is pretty true that MIT students are smart. What about a negative stereotype? What is an example of a negative stereotype? Yes?

AUDIENCE: So most people see that jocks are dumb or not so bright. So that's an example of negative stereotype.

CATHY L. DRENNAN: Yes, and in my experience, that's not true. There are a lot of very athletic people-- something that some people don't know about MIT is that most people participate in sports here. So

yeah, so a negative one. Again, they can be positive, they can be negative, they can be largely true, or not so true. I also want to introduce the idea of unconscious bias, because people are talking a lot about this. And actually, when I started this training, no one was talking about this term, and now it's *the* term. So let's talk about that.

So it's defined as social stereotypes about certain groups that individuals form outside of their conscious awareness. So in other words, they don't know that they hold these stereotypes. Unconscious bias. And I think people like this term because it's takes the pressure off. I didn't know I have it, therefore, I'm not responsible. It's all good.

But today, we're really getting in there, and I feel like I've been doing this training for a while, so I've become acutely aware of just how many stereotypes I have. So this is not about, oh, if it were true, freeing ourselves of these things. No. It's about making ourselves aware that we have them, and acting in such a way that we can counter the harm of it.

All right. So stereotype threat is the perceived risk of confirming a negative stereotype. So say, as a female driver you do something stupid, and have a whole bunch of men honking at you. Right? You're like, oh, I didn't want to let the world-- you feel pressure of doing everything perfectly, because you don't want to play into the negative idea there.

All right. So that's what stereotype threat is. And I think stereotype threat is still a good term for it, because unconscious bias threat doesn't really work. OK, so we're back to stereotypes. All right. So what are we going to talk about today? So we're going to talk more about these terms. We're going to talk about the fact that stereotype threat can lead to underperformance. So I'm going to show you data to support this idea.

We're going to talk about the fact that stereotype threat can lead to the idea that you're being judged unfairly. Sometimes you might be judged unfairly, and sometimes you're not being judged unfairly, but stereotype threat can lead to that feeling whether or not it's true. Everyone can be a victim of stereotype threat, and everyone has stereotypes. So it affects all of us. We all hold stereotypes, we all can be victims of stereotype threat.

This training is really for everyone in the room. And I have to say, this is not just about gender, it's not just about race. It's about anything that might make us feel different, anything that might make us feel under a microscope. If we're different in any way from the others around us, this can affect everybody. So it's for everyone.

This is the bad news. What about the good news? There's always good news. There's wise criticism. So this has been shown to alleviate the negative aspects of stereotype threat. So what is it? So wise criticism is criticism where you explicitly let somebody know that they are capable, or you believe they're capable, of a higher level of achievement. And there is data to suggest this goes a long way.

Again, if you can create this environment of trust, if the individuals in your classroom feel that you believe in them, you can criticize them-- I mean, this is important in Mentoring Lab. Criticism is how we learn. When we don't do well, we learn from that. It's all healthy and good. But we have to make sure that any criticism is delivered in such a way that the person recognizes that we believe in them.

Again, back to the student who never had a TA-- we need everyone to know that we believe that the person is able to do the work. And so, that is one way to mitigate the negative effects. All right. So I don't know if I told you this ahead of time, but this is an interactive training. So we want everyone to participate, and think about how this has affected me or someone I know.

So what we're going to do in a minute is you're going to pair share. Find a group of two or three, and turn to your neighbor and recall a time when you might have felt judged by some superficial characteristic. So it could be age, it could be anything. So think about that or-- and maybe and/or, you can do both-- you are worried about confirming a negative stereotype.

So that's the assignment. Think about it a little bit. You'll talk to your neighbor. I'll give you about five minutes or so. And then we'll come back in a group, and hopefully some of you will feel comfortable sharing your experiences with a larger group, and we can talk about it. All right. So let's take a few minutes, find someone, share a story.

AUDIENCE: So do you guys have any experiences like that?

AUDIENCE: Yeah, so I guess one of mine that I started being really aware of when I started grad school was that I was really worried about being taken seriously as a scientist, if I had a meaningful hobbies outside of work.

AUDIENCE: So I guess for me, when I came to MIT, I was really scared by the fact that there were few people that looked like me. And so, that put like a lot of pressure on me, and I felt that I had to carry a whole race on my back.

And also, I can remember one meeting that I had with one of the professors, and she was telling me that, I know that you come from a small college, and that your classmates are going to be from Berkeley and Harvard, and so it might be right for you at the beginning. And I feel that really, really impacted how I performed in some of my classes, and I wish that I had never had that conversation. So, yeah.

AUDIENCE: Yeah, being from a smaller school was harder. I was also from a smaller school, and in classes I was always thinking--

AUDIENCE: Yeah, yeah. Can I perform as well as other people?

AUDIENCE: As well. Mm-hmm.

AUDIENCE: Yeah.

AUDIENCE: And then being told that you might not.

AUDIENCE: Yeah, yeah, yeah. So yeah, so you question yourself. Sometimes you feel like you don't really belong here. And so, yeah, it can be hard for some people.

AUDIENCE: Yeah, I had a very similar experience to yours. I was directly told that students from Puerto Rico don't really do that well in first year classes. And so, when I while I was never doing terribly in class, I felt like I didn't have to necessarily do well at all. So I would actually not try as hard as I should have too. Just do well.

AUDIENCE: Because that's what they were expecting, right?

AUDIENCE: Yeah. I think the other problem-- I've heard many people that have had the same experience. So it's sort of like--

AUDIENCE: Yeah, I wish that some of the professors would understand that they're not generally helping you when saying these things. And maybe a training like this wouldn't help them a lot.

AUDIENCE: Yeah.

AUDIENCE: Yeah, because were they trying to-- they're coming from a place of trying to help you.

AUDIENCE: I think internally-- yeah, I think their intention was to help, but I think it's just--

AUDIENCE: Misguided.

AUDIENCE: Yeah.

AUDIENCE: Yeah.

AUDIENCE: Yeah.

AUDIENCE: Yeah, it's true.

AUDIENCE: So a time that I was worried about confirming a negative stereotype was when I first started graduate school. I was coming from a primarily undergraduate institution. I had never been at a big research university. And so, I didn't really know what to expect or what I was getting myself into. And I guess, when people first explained to me what the expectations were in terms of how much I should work, and what vacation policies were, the first time they told me I literally laughed out loud. I didn't think they could possibly be serious.

And then I realized, whoa, I might be in over my head. And once I realized that, I was like, oh, man. People are going to think that I'm not serious about my job, and I don't know what I'm doing. So I had to pretend all of a sudden that I was all focused on science, because I didn't want people to think that I wasn't taking it seriously because of my background.

AUDIENCE: Yeah, no, I feel the same way coming to MIT. Especially, coming in for me, confirming the negative stereotype, also just being judged for my physical attributes as a woman of color. I feel like there's a lot of stereotypes, negative, around my ethnicity and my race. And one of the things that I heard a lot of times it's the idea that, you speak well, or you're articulate for a black woman.

And this is not only my story. I've had a number of my colleagues say the same thing to me. So it's something that's just constantly being battled against a negative stereotype. And also this idea that coming in-- a combination of my, I like to call it an intersectionality of all my personalities and all my identities. So I'm a woman of color. I am from the Caribbean. I went to a small school, but I'm not only just a small liberal arts school, I went to a small HBCU, which is a historically Black college and university.

And I feel like all those combinations also mix. Get into a classroom, and being one of the only persons of color makes me feel extra pressure for confirming these negative stereotypes that are thought against people of color. So in the classrooms I try not to ask questions, because I don't want to out myself as not being smart, or not as much as my other colleagues who might

have went to bigger schools, and have had targeted classes on this particular subject, for example.

So it's been definitely the idea of being the "face of the race" also, because you don't want to spoil it for other people who come along. So it's been a little bit like you feel like you have to not ask questions, you're not out yourself. Anything you say might prove that negative stereotype, and it's a lot of pressure to do. So yeah.

AUDIENCE: Yeah, totally.

AUDIENCE: I can't necessarily relate to your experience, but the flip side of the coin on that is I do have one sliver of an experience where I kind of feel like I can relate to what you're talking about. And that's when we're having conversations about diversity, I feel like I don't want to say something that might sound ignorant, or naive, or uninformed. Because I feel like if I end up saying something stupid and offending someone, I set the conversation back a step, and then I end up confirming the stereotype that all white men don't care about improving diversity in science.

AUDIENCE: Yeah, well, that's very understandable. And I feel like it's very crippling too, because he might have really good experiences that you want to share, and good contributions that you could make in that sense. And you can't do it because of that negative stereotype. You're really confirming that. So it's definitely very crippling.

AUDIENCE: Yeah, I think it is detrimental to the whole cause, because it takes everybody, right?

AUDIENCE: It does, it does.

AUDIENCE: For all participating.

AUDIENCE: It is.

AUDIENCE: OK, so I think-- let me see. Thinking about a time when I felt judged about a negative stereotype. So I'm pretty short. I don't know if you noticed when I walked in, but I think that-- and I look pretty young. My sister's two years younger, but I'm always considered the younger sister, and I think that that's led me to always be really afraid of confirming that women are weak, or not able to do things on their own. So I'm very conscious of not asking for help with certain situations.

If I can't reach things or things like that, I know where all the step-stools are. Or I've been known to climb on shelves in grocery stores instead of asking for help. And it's one of those situations where I'm very much afraid, and I often lead with the fact that I have a black belt in Taekwondo to kind of help paint this picture that I actually can do things for myself. So, yeah.

AUDIENCE: I feel that, because I'm literally the same way, including the black belt. (LAUGHS)

AUDIENCE: Yeah.

AUDIENCE: It's one thing I lead with.

AUDIENCE: It's something that kind of shocks people, because they're like, oh, you're so little. I don't know. I feel like I'm always so worried about the fact that just because I'm so little-- and I've always been this little, it's not like I was the tallest person in my class-- that I need to be able to show that I can take care of myself, and be independent, because of this stereotype that women can't, and need a man to make sure that things are OK for them. So, yeah. That's where I'm at with that.

AUDIENCE: Oh, I'm sorry.

AUDIENCE: It's OK. I can't get taller.

AUDIENCE: Yeah, well, when I was six years old, I actually used to race cars. And I remember there was a day when I should've gotten second place in a race, but because the three boys in front of me crashed right before the end of the race, they gave me fifth, because they were in second and third and fourth before the flag went down. But then I crossed the line first, so I should have gotten second. Anyway, after this whole situation is over, one of the boys came up to me and was like, oh, well, you're a girl. Of course you can't get second place. And I was like, excuse me? Yes, that was over 20 years ago.

AUDIENCE: And that was when you were six.

AUDIENCE: That was when I was six.

AUDIENCE: How old was the--

AUDIENCE: I think he was seven. So, yeah. It's still there. So, yeah. Good times.

AUDIENCE: Yeah.

**CATHY L.
DRENNAN:**

All right. Let's come back as a group. There was a lot of good discussion. I can't wait to hear what you're going to say. But I thought I would start out by sharing a story to get us going. So in the first category, a time that you were judged. So I think back to a time when I was graduating from Vassar College. These are the old days, where if you announced who got an award, they'd post a piece of paper in the student union. There was no email thing to send out to people.

And so, everyone gathered around the list of people who had been named Phi Beta Kappa. And I was really excited that I had been named Phi Beta Kappa. And so, I'm leaving after having looked at the list, and I saw someone who I hadn't really talked to since freshman year. He was in my dorm, and it was one of those things like freshman year, where the entire floor of your dorm like goes everywhere together.

You go to the dining hall together, you go to parties together, because there's this herd effect. Anyway, this guy Phillip had been in my herd, but I'd never actually talked to him. So he walks up to me and he looks at me, and he said, you were on that list. And I said, yes. And he just looks at me, and then he said, it never occurred to me that you were smart.

[SOFT LAUGHTER]

I mean you could just see the wheels turning like, her name is on the list! Her name is on that list! *She's* smart? And I just thought like, what did I do that this was such-- It's like, oh, whatever. If they saw it, they might not have ever thought about it one way or another, but clearly, he had formed an extremely strong opinion that there was no way that I could be smart, and this was just messing with his worldview, the fact my name was on the list. So what was it about me that was just so inconceivable to this person that I could be smart?

OK, so in the second category, pretend you're at MIT. In the Chemistry Department at the point where I was coming up for tenure, there was one female professor who had gotten tenure, and then they had hired two more in with tenure. So I was number two. Case study. Would she get tenure? And I felt like they were all watching. Is she going to meetings? How many papers has she published? Is she going to make it? What do you think? Lay in the bets. What are the odds?

I don't know. There probably were odds. I don't know what they are. I never want to know. But I just felt like, man, my not getting tenure it's not really about me anymore. It's, can *women* get tenure? And it was all riding on my shoulders. I was going to provide the answer, and people

would make decisions about their lives, I was afraid, based on whether it worked. Oh, it didn't work for her. I'm not sure I want to go forward.

That is a lot of pressure when you feel like you're carrying other people besides yourself around. So that's an example for me. All right. So you don't have to have as profound examples, but everyone has some Phillip in their life, right? Has somebody like that. So let's hear. Who wants to share about this? Yeah?

AUDIENCE: So in addition to being a scientist, I'm also a musician, and when I got to grad school I felt really insecure about having this hobby, and thought that I might not be seen as serious of a scientist because I like to play music as well. And so, I downplayed my hobby, and didn't join ensembles as much. But even then, when I started in grad school participating in an ensemble, I was really worried I'd confirm the stereotype that just because I was also a musician, I was less serious of a scientist.

CATHY L. DRENNAN: Yeah, thanks for bringing that up. I think that's a really great example. So it's just we have these ideas, and it's like we have these square holes and round holes, and we're trying to bat everybody into it. There's many different things that people can do if they're scientists. There's many different hobbies and other interests that they can have, and we shouldn't have such a narrow definition. So someone else? I heard lots of discussion going on. Yeah?

AUDIENCE: So in terms of being judged by someone for a superficial characteristic, as an African-- Afro-Caribbean I should say-- woman in the scientific setting, I feel like one thing I get a lot is that, you speak very well. And usually I'm like, for? Why? But I think it's definitely I'm clearly a minority, so basically there's some negative stereotypes about whole women of color should present themselves, and I don't fit in to that stereotype.

So every time I do give a talk or I do express my opinions, people say I'm very well-spoken. And this is not only my own case. I've heard a number of my friends say the same things, even sometimes from their advisors and people who have gone through a lot of students. So that's one case where I feel like I've been judged superficially for a superficial characteristic.

Another thing of confirming a negative stereotype also comes back to my ethnicity. You mentioned feeling like you carry the weight of persons on your back, and thinking about being, again, an African-American woman, most of the time the only one in a room. Not today.

[LAUGHTER]

That's great. But most of the time it's being the only one in the room. And especially coming from a small college, I also felt coming into my first chemistry classes, there was this pressure that I put on myself to not confirm these negative stereotypes about people of color in terms of that they're not smart, or they're not good at math or science, and I didn't belong there.

And it's not because people around me said anything. It was definitely internal that I felt like I had to not answer a question, or not ask a question because I didn't want to look as if I didn't know something, or all my classmates knew it and I didn't know it. So it's that weight of one, not confirming that negative stereotype, and also not spoiling it for everybody else who comes after me who is a URM from an HBCU.

CATHY L.

Yeah. Those are both really great examples. Thank you for sharing those. I think that really

DRENNAN:

gets to the heart of what we're trying to talk about. Feeling judged, and you get these compliments-- and I've gotten this for some of the talks. It's like, that was actually pretty good! What was your expectation ahead of time? Or, you spoke well! Like, thank you.

Yeah, and that extra pressure to-- who else is coming along with us? So thank you for sharing those. That's really great. Maybe one more. Does someone else have something you want to share? Yeah?

AUDIENCE:

When I participate in conversations about improving diversity in science, a lot of times I'll worry that if I ask an uninformed question or make a naive suggestion that I'll set the conversation back or offend somebody, and ultimately confirm the stereotype that white male scientists aren't serious about improving diversity in science. So then I'll tell myself, just sit back and listen to other people. And then as soon as I start doing that, I'll start to worry, how are people perceiving this? Do I look sullen and like I don't care about this? And then, again, I worry that I'm confirming a different stereotype about white men in science.

[SOFT LAUGHTER]

So I think ultimately, it's important for me to remember that my voice is overrepresented in science, and I should make a concerted effort to actively listen to other people's perspectives, but also recognize that by spending so much mental energy worrying about how other people might be perceiving me, I'm ultimately undermining my own ability to make a positive contribution towards improving diversity in science.

**CATHY L.
DRENNAN:**

Thank you for sharing that. I think that's a really good point. I've had people, when I've done this training before, a man say that he felt very much under sort of stereotype threat when he was taking a woman's study course, and he was the only guy in the class. And that sometimes he felt like if he spoke up and what he said, that he was going to really be judged by it, and it was just a very uncomfortable situation.

And I really feel like what we want to do here is start the discussion. Everyone's voice is so important. And sometimes it drives me crazy when I'm hearing about women in science, it's like, OK, you, woman, go fix this. It's like, I can't do this. I think we all need to be talking about this and doing this together. These problems are not problems for women to solve, or for people of color to solve. We want to improve science.

We all need to be part of this discussion, and everyone's voice is so important. So we want to have a situation where everyone feels like they can speak, and everyone is going to listen to what other people have to say. So very on point. Thank you very much. All right. So I think we should get back, and we want to go back because I have some data to show you. And this is MIT, and we're scientists, so let's look at some data.

All right. So there is a book by Claude Steele called *Whistling Vivaldi, and Other Clues as to How Stereotypes Affect Us*. Claude Steele is often viewed as the father of stereotype threat, really coming up with this concept and making people aware of it. And his book has a lot of data in it. A lot of different studies. He summarizes studies that many different people have done.

So some of the studies are more social studies, some of them are more in the neuroscience area. So some studies that he describes actually look at brain waves and blood flow in the brain. And so, they will put people under stereotype threat, and there's a variety of ways you can do it, poking at those negative stereotypes that we talked about, and then actually watch blood flow or brain activity.

And you can see movement from the part of the brain where it's about logic and reasoning, to, when people are under stereotype threat, the part of the brain that's about fear, about fight or flight. And so when you're in the classroom, the goal is all the students their brain is with logic, right? They're processing the information and they're learning. You don't want people in your classroom where the brain is very anxious, and worrying about whether you belong and whether you can do it.

So there's an actual biological reason why stereotype threat can lead to underperformance. Your brain's not doing what your brain should be doing. It should be in the logic area, not in the fear area. So this is one thing that's talked about in his book. So anyway. So some of the studies that he did, it was groups of female undergrads.

Stanford quite a good school. People who get in there, very smart people. And so, he looked at the SAT scores of a group of women, and then he divided them into two groups. And they should have equal math abilities based on their SAT scores. So for one group, he either reminded them of their gender before the exam, and in some case, didn't say anything at all. But in the second group, he told them that the exam had no gender bias.

And so, he would start out saying, well, you may have heard that women often underperform on SATs in the math, but we've been working here, and we've created a math exam that has no gender bias, so everyone can do up to their full ability. There's nothing holding you back. And what was really interesting that this group performed very well compared to the other group that was either reminded of their gender, or sometimes nothing was said about gender at all.

So when these women thought that they could do as well as they could do, they overperformed or outperformed the other group. So there's a number of these kinds of studies done in different ways showing again that if you feel like you can reach your full performance, you get there. But if you're reminded of these issues, and that you might be confirming a negative stereotype, or you're worried about confirming a negative stereotype, it can lead to poor performance.

All right. So stereotype threat can lead to underperformance, which is a problem in a classroom, for sure. The other point that I brought up before, and I want to come back to, is that it can also lead to a feeling of being judged unfairly. And this is one of my favorite studies, and it's back from the 1980s. So in this study they said, all right, we want to address the differences-- how people are treated if they have some kind of physical disfigurement, in particular, a scar on your face.

So he said, what we're going to do is we're going to bring in a makeup artist from Hollywood, they're going to put a scar on your face, and then we're going to send you into this room and we're going to watch the interactions. And we want you to tell us, are you being treated differently because you have this scar on your face?

So the volunteers sat in front of the mirror. They had the makeup artist come and this scar was put on their face. And then right before they were supposed to go in, the makeup artist came back and said, we're just going to touch it up, make sure you're ready to go. They removed it entirely, but the person had no idea. They thought that the scar was still on the face. Went into the room, there was a discussion, came out. The volunteer said, oh, I was treated entirely differently with this scar on my face.

And other people had watched. There was nothing going on. But they were just sensing-- they were looking for signs that they were being treated unfairly. And when you look for things, sometimes you can find them or interpret them, when they don't really exist. So right now, some people are sitting, might have their arms crossed a little bit. And if I were an insecure person, I could say, that person's sitting there is thinking there is nothing this woman has to tell me that I want to hear. And they just are sitting like that.

But then I also know it's a little cold in this room. Someone might just be a little bit cold, and that's why they're sitting like this, right? You can interpret all sorts of things. If you're looking for a sign that somebody is questioning you, you might be able to find it even when it's not there. And sometimes it's really there. Sometimes people are judging. Oh, yeah.

[LAUGHTER]

We can have stories later. But sometimes they're not. So I just want to give you one example. So this is the other counter-- a guide to reducing stereotype threat and maximizing student performance, also a guide to Cathy's most embarrassing moments. But there was one time I was meeting with a professor, I was pre-tenure. Again, I wanted to get tenure. Very nervous about this whole thing. And so, this person in my field, likely a letter-writer, is coming to my office. And I was really excited.

So I was like, I had results that he was going to like. I knew he would like these results. I printed him out, like these slides. I had everything all ready. I thought through my spiel. I was psyched. He he came. And so he came in, he's like, I'm so glad you're here visiting. This is great. I have these new results I want to show you, and I pull this out. And he goes, you know, I was sort of wondering, how's your experience been here?

I was like, good, good. Very good. Now, we had this result-- and he's like, but I had some questions. Do you feel like you've been treated OK? 30 minutes went by. He did not look at a

single result that I had. And I just thought, this guy has just decided that there is no result that I could possibly have that would be interesting enough to pay attention to. And so, he's just going to spend this half hour chatting about this and that, and things about me being a junior faculty member, whatever, and just clearly disrespectful of me.

So that was my take. Find out later he has a son that's starting as an Assistant Professor. He wants to give his son advice, but he hasn't been an Assistant Professor for a long time. Things have changed. So he said, when I go to talk to Cathy Drennan, I'm going to ask her a lot of questions about being an Assistant Professor, because she has been so hugely successful that I want to take how she's done things and tell my son about it.

So I could not have been more wrong. I thought he was judging me unfairly. Turns out, that was not the case at all. And so, because other people-- I've one male professor explain to another male professor my data without involving me in the discussion, because what could I possibly know about it? So I've had these experiences, but then I'm looking for these experiences in other places, and sometimes they're not there at all. Sometimes a person is being respectful.

So when you feel like you're under stereotype threat, you can sometimes take a situation entirely incorrectly. Now, he could have also said, hey, Cathy, you've been so successful. Let me ask you questions. That could have-- but whatever. Whatever. So I think this is something also to think about, that people are looking to each other like, do you trust? Do you believe in me? Do you trust what I'm going to say?

We're trying to get a sense of this. And sometimes we may get it wrong, and sometimes it may not be there, but everyone in the classroom is not the same. Even if you treat everyone the same, they're not always the same, because people are coming in with baggage. And I've got baggage, let me tell you. I got some baggage. I'll put my baggage up against your baggage, but everyone is coming in with something.

All right. So I think you already know the answer to this one. Who can be a victim of stereotype threat?

ENTIRE Everyone!

AUDIENCE:

CATHY L. Yes, everyone.

DRENNAN:

[LAUGHTER]

In fact, studies show that it's the strongest students that are the most affected. So if you care about what people think of you, if you care about doing well, if you're ambitious, if you want to do important things in your life, you care about these kinds of things. And if you're at a place that has a good reputation, like MIT, that can lead to imposter syndrome.

So most you've probably heard of imposter syndrome before, but this idea that somehow you were only accepted to MIT-- your name is like someone else, and they weren't going to accept you. But then they made this mistake and then somehow you got in, said the person who was below you in the line when they were supposed to get in.

And that everyone else here is brilliant except for you, and someday that people are going to figure out that you're trying to look like a nerd-- or a horse. You know, you've got your horse stockings on and your horse cape. Or your zebra cape and your zebra stockings, but you're not really a zebra. And that you're wearing your nerdiest clothes, but you're really not an MIT nerd.

So this is something that so many people at top universities are affected by, and this is really important when people are, again, under stereotype threat. They're feeling like, man, I'm the only one who doesn't really belong here. So imposter syndrome. OK. Another teaching tip, because you'll all be teaching. Before you teach on something, look up what it says on Wikipedia. Just double check what it says. So what do you think Wikipedia says of the people who are most affected by imposter syndrome? What particular group? Any guesses? Men?

AUDIENCE:

[INAUDIBLE].

[LAUGHTER]

Graduate students. Someone has been googling Wikipedia. That is, in fact, correct. So a lot of people say, oh, it's women. But the data actually shows that men and women suffer equally, which is not really my experience. I think that if this is true, it's just that women talk about it all the time and men don't. But apparently, the data shows that it's equal among men and women. And it is commonly associated with academics and widely found among graduate students.

So again, it's people who want to do important things with her life. Graduate school. Anyone who's in graduate school-- that's a pretty big deal that you're in graduate school. So you really care about what people think. You care about whether you belong. You're thinking, how did I end up in graduate school, how did I end up at MIT, and do I really belong here? So these are natural things for people to think.

And I will tell you that a number of faculty have reported that yes they suffer from imposter syndrome. I think anyone who is honest will say that they do. So this is a big problem. All right. So let's do another exercise. You might have wondered about the title of Claude Steele's book that I mentioned, *Whistling Vivaldi*. Where does that title come from? So he explains the title, which is a good thing, because it is an unusual title.

So he said that it comes from a story that he heard of this young African-American man who was in the South Side of Chicago, and this man was a musician. And he was walking one night, and there was an elderly couple walking on the street right near him. And they saw him walking near them, and he saw them walking faster. And they were an elderly couple, so they were really trying to walk fast.

And he felt kind of bad because they were kind of old. And so, he wanted to kind of yell out at them, you do not need to worry about me. I'm not going to do anything bad to you. But yelling that probably would be even more terrifying. So we thought about it and he said, I'm going to start whistling Vivaldi, actually whistling the music of Vivaldi. And so, he started whistling the music and the couple slowed their pace, because they thought, this is someone who is classically trained or loves classical music. Not so much associated with someone who's going to steal my handbag. And so, they relaxed.

So in this book, Steele asserts that we all whistle Vivaldi from time to time. We all try to fit in and make other people more comfortable with us. So this is a little bit of a harder thing to think about. Have you ever whistled Vivaldi? Have you ever tried to fit in? And let me just give you an example that I heard to help you think about this.

So one student said that he was actually from a very religious family, and he was used to praying before eating a meal. But in the lunch room of a science building somehow that felt weird to pray before eating. A lot of people have this idea that if you're very religious that somehow that's counter to being a scientist, because you have faith vs. Scientific facts. And he wasn't sure how people would judge him if they knew about his religion.

So even though he really did want to pray, he stopped doing it because he just thought he wouldn't fit in. It would make other people feel uncomfortable. He wasn't sure how others would feel, and if they would accept him the same way as a scientist if he prayed before a meal. So that's an example of whistling Vivaldi. So think about it for a minute. Find your partner. Talk to them about whether this has ever happened to you, and then we'll come back together as a group in a few minutes.

AUDIENCE: Yeah, so when I think about whistling Vivaldi, for me, the point where I feel like I'm really changing or trying to conform to an appearance is pretty much any time after 9/11. When I go through the airports I'm always conscious of what people might be thinking about based on my skin color. And so, when I go through, every day right before I travel, I shave my beard off. I try to be dressed up a little nicer.

And I even feel myself being a little extra friendly to TSA gate agents, because I feel like there's this negative stereotype hanging over me. And I feel like even though it's on my mind, and it feels sometimes like it might be on everybody else's. I feel like maybe my ID's looked at a little differently, and things like that. So I make sure they can hear my American accent, make sure they don't see any facial hair. Things like that. I try to be extra nice, extra polite. Just feeling a little more nervous, I think, is really the cause of that as well.

AUDIENCE: Yeah, that's really good example.

AUDIENCE: Mm-hmm.

AUDIENCE: Mine would be in professional settings, especially at conferences or any presentation of some sort, I try to cover my tattoos the best way I can. And I also have a nose ring, and so sometimes I would wear like a clear nose ring so people only if they're really up close to me can see that I have one. And that's just to mitigate any stereotype threats that people have. Because you walk into a room and you have tattoos visible, or your piercings, especially on your face, and that can lead people to think differently about you and what you're capable of doing. And so, I just want to lessen that and have people look past that.

AUDIENCE: Yeah.

AUDIENCE: Yeah.

AUDIENCE: I think that's a really good example. I mean, it's all the same thing, is we feel like our

appearances are telling something, and we're really worried that the message is going to be negative there.

AUDIENCE: OK. So when have we whistled Vivaldi?

AUDIENCE: Yeah. I think I especially do it whenever I'm with friends and family. So since English isn't my native language, but I feel like I can speak it pretty well, so then whenever I go back home, my friends and family don't always speak English, I actually intentionally mispronounce certain words just to keep that connection with them.

AUDIENCE: Yeah.

AUDIENCE: Since I've been gone for like a few months, and seeing me every so often, I just want them to feel like I'm still the same me I was.

AUDIENCE: Yeah.

AUDIENCE: And then when I'm here, I always try to pronounce everything super well, so that's not an issue when someone's talking to me.

AUDIENCE: Yeah.

AUDIENCE: Yeah.

AUDIENCE: [INAUDIBLE] similar?

AUDIENCE: Yeah, so I guess for me, one of the big things about grad school was that I sometimes felt pretty isolated as one of very few women in our department. And so, over time, I realized I started dressing more and more like a man, to fit in and to be taken more seriously, and just so that I didn't have to feel as different.

AUDIENCE: Yeah. So, yes, like with that, I feel like I've always wanted to be who I am, and I don't want to be somebody else. So I guess, along those lines, I've had one conversation with one of my professors where she was explaining that in research, when people were giving presentations, they usually wore light colors like gray, and white, or black, and that you shouldn't be too colorful.

One time we were going into a conference, and I was wearing red. I was like really colorful, and then she was like, wow. I mean, that's not what we talked about. I'm like, yeah. Science

can be colorful too.

AUDIENCE: That's great. (LAUGHS)

AUDIENCE: I want to be who I am. And the next minute, I saw a professor, he was so colorful, like red and orange all over the place. I was like, yes. That's what I'm talking about. Be who you are. Be free. And that's how a science should be. People should be comfortable in their skin and who they are.

AUDIENCE: Yeah.

AUDIENCE: Yeah.

AUDIENCE: Thank you.

AUDIENCE: When I'm meeting new scientists, especially younger ones, or people who I might have to mentor or train, if they ever start to open up about an experience where they felt discriminated against or harassed, I can't necessarily relate to that experience, but I do want to convey that they can trust me, and that I'll listen to them, and I'll help them in whatever way.

Because I can't really share a personal experience. A lot of times I'll basically turned to relevant literature, like the book *Whistling Vivaldi*. And I'll try to communicate, I'm on your side and I'm safe, by talking about a subject that communicates to them I'm putting effort into this and I care.

AUDIENCE: Oh, that's a really good one. It makes a lot of sense for me. It's more just going back again to my identities. I have an accent, because I'm from the Caribbean-- and I feel like this is common for lots of international students in the scientific setting-- I definitely try to put on a more, quote, unquote, American accent, to ensure that my audience is not being distracted by my accent, but really focusing on the science, and really trying to be more scientific, quote, unquote.

And the other thing, in terms of physical appearance, I have a lot of hair.

[LAUGHTER]

It's very contained right now, but it's really big. So definitely, in scientific settings, I definitely try to pull it back to look more what, quote, unquote, would be [INAUDIBLE] kept. It's really kind of weird, but yeah, so you'll definitely see me either my hair slicked back in a scientific setting,

versus when you probably will see me in lab, or something like that.

So that's definitely the way I whistle Vivaldi, because, again, I don't want people to be distracted by my hair, or thinking I don't look professional. I don't want that to detract from what I'm saying and the science that I'm doing. So that's definitely another occasion when I whistle Vivaldi.

AUDIENCE: Yeah, that makes a lot of sense.

AUDIENCE: So I guess for the whistling Vivaldi, I did have an example that reminded me of this when I was an undergrad.

AUDIENCE: Mm-hmm.

AUDIENCE: So I joined a lab my freshman year, and I have always been more traditionally feminine. My, I don't know, style dressing. And I kind of noticed I was one of the only women on the floor, and I knew I stood out. And I specifically remember that there was a professor who asked me what I was doing around on the lab floor, and told me I didn't like the research type. And that really stuck with me, and after that, I really changed.

I had my lab style and then my everyday Lindsay style.

AUDIENCE: (LAUGHS)

AUDIENCE: Whenever I was in the lab, I would always wear very baggy clothes, tennis shoes, my hair tied back. And I felt like my glasses made me look more studious, so I would always wear my glasses. It's just something I was very conscious of.

AUDIENCE: Yeah.

AUDIENCE: I would specifically dressed in one way when I was being a scientist, and I would dress another way when I was in my outside life.

AUDIENCE: It's like not easy, because in some setting you're judged for being dressed up. In other settings you're judged for being dressed down.

AUDIENCE: Yeah.

AUDIENCE: Yeah, I totally get that. Yeah so, in my case, I think it's more about my race. I personally have a stereotype that Asian women that are recently immigrated are more reserved, quiet, and, I

don't know, obedient. And although no one actually ever negatively judged me for that, I'm constantly afraid to confirm that negative stereotype.

So even if I'm not really that kind of person, I try to be very vocal and talkative, especially when I'm surrounded by people that I'm meeting for the first time, so I'm giving like an impression that I want to engage in the conversation. Yeah, it was not an easy thing, but I've been doing it.

AUDIENCE: Yeah.

CATHY L. DRENNAN: All right. So I'm just going to start out. I'm going to give you one example. This time it's not mine, but I think that it was one of the ones that someone suggested that really resonated with me. So I want to share it. So this sense of feeling the need to suffer for your science, and that other people see someone that are talking about how much they suffered for their science. And instead of just saying, wait a minute, I sleep eight hours a night. They're like, yeah I gotta get in on this suffering for my science thing.

So an example, someone was talking about how they knew that this person was going on this ski trip over the weekend, but before they left lab to go on the ski trip, instead of saying, hey, see all Monday. I'm going skiing. They're going out like carrying these journals and papers. And they're just like, oh, I got a lot of reading to do this weekend. Does anyone have a cart? I can barely carry it. I'm going to be reading all weekend.

This is a scheme. What's going on? But it's like, if you're really a scientist, if you're a true scientist, if you're a real scientist, you suffer. You have no hobbies. You work day and night in the cold room, in the dark. I mean, you're just 36-hour experiments. There's no time to shower. There's no time to sleep. And instead of just saying and sending a message to maybe new people in lab, and undergrads, and I think this has come up, especially with women, that like if you do not give of yourself completely, you're not a, quote, real scientist.

And a lot of people who are thinking about science, especially women, think, I'd really like to have a family, and I know I might be doing a little more of the caregiving. So I don't know if I can do science. I might have to do something else. Because there's this notion that you have to suffer so deeply for your science. And people buy into this. They don't want to be the one saying, I don't know what's wrong with you, but I shower every day. Right?

[LAUGHTER]

They're just like coming up with something else that they're saying. It's like, well, yeah, but my experiment was even worse! And I had to walk uphill both ways to do it, right? Everyone gets into this in the whole lab culture, and they're trying to outdo themselves with the degree of suffering. So that's one example that came up. And I do think that these kind of things-- it sounds funny, but it's important, because it sends a message of what it takes to be a scientist that is not really true.

And if we have well-adjusted human beings doing science, I'm OK for that. I think that's a good thing to have well-adjusted human beings doing science. So we have to think a little bit about fitting into a culture, and what that is, and what we do to fit in. All right. So that's just one example that was shared with me before, which I thought was a good one. But it seems like you guys were having some lively discussion. So who would like to start off by sharing what you were talking about? Yeah?

AUDIENCE: Yeah, so depending on who I'm talking with, I actually tune my accent. For example, when I'm back home, I intentionally mispronounce certain words so that I can talk with my friends and family. And then whenever I'm here in an academic setting, I try to pronounce everything correctly. Yeah.

CATHY L. DRENNAN: Yeah, so the sort of, I'm still sort of one of you. I've gone off to this place of MIT, but I'm back having these conversations. And then you present a different side when you're here. I've heard that a lot, that sometimes being at a top place, people feeling uncomfortable going home, that the family members just feel like they don't want to sound stupid, so they just don't know what to say to you anymore. It's like, it's still me. It's OK. (LAUGHS) That's great. OK. Anybody else? Yeah, yeah?

AUDIENCE: Yeah, so I personally have a stereotype that Asian women, especially those who are, quote, unquote, fresh off the boat, are more reserved and quiet. And while I'm a person who kind of confirms that stereotype, when I'm with people that I'm meeting for the first time, I try to be a little more vocal and talkative, to give an impression that I want to engage in this conversation. And sometimes that makes you feel bad, because I'm not true to myself. So, yeah.

CATHY L. DRENNAN: Yeah, yeah. People may not believe this about me, but I used to be really shy.

[SOFT LAUGHTER]

So, yeah. So all those years of imposter syndrome-- all right. I'm going to wear my not-shy clothes, and talk like a not-shy person. But yeah, I had to really struggle with that, and I think it's very hard. When you are worried about that stereotype, it's pushing yourself out. Being a little more-- so that's it that's a really, really nice example. Anyone else? Yeah?

AUDIENCE:

Yeah, so I have several tattoos, and I also have a nose piercing. And when I'm in professional settings, especially at conferences, I try to cover up my tattoos, and sometimes they even put in a different nose ring that's clear so you really can't see it unless you're close up. And I try to do that in order to not confirm a negative stereotype of people who decide to put art on their body or have extra piercings, and to appear more professional, and that I understand and know what I'm talking about.

CATHY L.

DRENNAN:

Yeah, that's also a really-- everyone's got really great examples. That has kind of come up in [INAUDIBLE] really thinking about how you're dressed and other things. And one time I had videotapes to use in freshman chemistry, of scientists talking about how they were using chemistry. And I got all this feedback because one of the people in the video had piercings and tattoos.

And they're like, but that's not a scientist, right? But then he talked so articulately, and it was mind-blowing. But we do have these ideas of what scientists should look like. I partly blame Hollywood. Polyester pants, and the lab coat, and pocket protectors. And it turns out scientists look like everyone else. But then we worry, and sometimes try to fit in, and whistle a little Vivaldi to hide maybe some parts of that. And so, yeah. Really, really good examples everyone. OK. Let's move on. Who has stereotypes?

ENTIRE

AUDIENCE:

Everyone!

CATHY L.

DRENNAN:

Yeah. Sorry. Sorry for the bad news. But let me show you some data in case you're not convinced. All right. So there's a whole bunch of studies, and I'm just going to tell you about a few of them that get at this fact that we all do have stereotypes. Because we all live in a culture, we're all part of it. We are, in fact, not in the cold room for 36 hours. We come out to socialize with other people at some point, and so we develop stereotypes.

All right. So there are these a bunch of different studies where they show groups, multiple different CVs. And they have one CV that's clearly a man's name, another CV that's clearly a

woman's name, and then they ask this group, pick the best candidate for something. And the data show that if they see these are designed to be very, very similar-- similar kinds of schools, similar numbers of publications, similar awards-- that people will pick the CV with the man's name on as being better.

And importantly, women do this too. So this idea of, let's put a woman on every committee so that we make sure that this committee is doing the best, picking the best candidate, whatever, women do the exact same thing as men. They also pick the male candidate when the CVs are very similar. So a lot of these studies were done in the English profession, but Joe Handelsman and a bunch of others in this publication, in PNAS in 2012, redid this CV study, but it was only for scientists.

So people would say, scientists are logical, right? We can't have stereotypes. We're about facts. We're about data. We are so logical we can't possibly really have stereotypes. And so, clear convincing evidence that that is, in fact, not true. Scientists are just like all other human beings, as it turns out. They're people.

Anyhow, so this study. Loved this study. Jealous of this study. Why did I not do this study? Anyhow. So what they did is they took this resume, CV, said it was for a lab manager position. They had the name John on it or the name Jennifer, and they sent it to different people, and then saw what people thought collectively about John, and what people thought collectively about Jennifer. Exactly the same CV, so they should have thought the same things about both of them, because it was the same.

But then they compared for the male name versus female who's applying for this lab manager position, they thought that the man was more competent, that the man was more hireable, and was going to be easier to mentor, and also should get pay to lot more. Now, again, let me emphasize, these are identical documents, except one has the name John on it, and one had the name Jennifer on it.

And they looked at how men viewed this and how women did. It was male faculty, women faculty, again, for a lab manager position. Women thought the same thing. Women thought that the CV with the name John on it was a lot more impressive than the CV with the name Jennifer. So scientists, the ivory tower, is just locked-in people with the same prejudices that you find other places. The same stereotypes. All right. OK.

So we need some good news. I think it's time for good news. I've convinced you that you can

all be victims of stereotype threat, that you all have stereotypes. Probably, you're all worried about imposter syndrome. If you didn't have it before, I'm sure you do now. But you know that I have it. Maybe that means like-- anyway. Good news. Wise criticism. So this can be used to mitigate the effects of stereotype threat.

And again, it's criticism that's delivered in such a way that students feel like they're capable of a high level of achievement, that students are less defensive and feel less threatened. And so, here, again, it's not about whether there's criticism or not, it's really about how that criticism is delivered. So I'll just give you a brief example what I think about here.

When I started as Assistant Professor, it was the first time I was writing a paper from my lab that my advisor's not deciding it's OK or not. This is for me. So I gave it to one of my senior colleagues to critique before I sent it out. It came back covered in red pen. [INAUDIBLE] And I was just thinking, what was I thinking? I can't be a professor. This is the most ridiculous thing. How did I ever think that I could possibly do this?

But then I got a little perspective on it. I realized that this professor had taken time to not only read the paper through and make comments, but there were notes about reading the background literature on the paper. This wasn't their field, so they had read all the references and thought about how I could have improved the paper. Who has time to do that? The only person who has time to do that is someone who is completely and totally dedicated to my success. So it was criticism. It was criticism. There was criticism!

[LAUGHTER]

But it was criticism that was delivered because they believed I could do this, and wanted to help me, put their money where their mouth was, spend time helping me be successful. So next time you get back a draft covered with red, don't think of it as harsh, I can't do it, blood of a massacre of the paper spewing out. You think about it as love.

[LAUGHTER]

Criticism takes time. It's love! Red love pouring out all over the paper. Criticism is important, but the way it's delivered-- if you feel it's delivered in a way that the person really believes in you, then it can really motivate you to do better. So criticism is good, but how you deliver it makes a huge difference.

All right. So Mary O'Reilly who is a graduate student here at MIT, did all these really cool little cartoons. Little call out to Mary, now. You're a student now, but think about what you can do. You don't have to sacrifice completely for your science. You can do art on the side. So Mary had a hobby and it's put to good use. So which response would you rather hear if you did poorly on a test? And I don't know if you can see this. This is a C-, which is not a good score for someone who is a high achiever.

Undeserved praise can be super harmful. "This is a good score for you. You should be pleased." What is this person telling this person by giving them that praise? That's the best they can do. You should be happy with a C-. No. No one should be happy with a C-. Of course, if it's pass, no record, and you're just shooting for that pass-- but, no, no, no. No one should be happy with that. All right. So you have to be careful about that.

The worst thing you can do is send the message to someone that they messed up, but that's all that it can be expected of you is to mess up. Bad criticism. We may have all received that. Yeah, you'll have to try harder if you want to pass. No feedback can also be harmful, because you might have this idea that you don't belong here. And if no one's countering that and telling you you do belong, then you're just taking that message away.

And wise criticism can be, again, the most powerful thing. Saying, hey, I know you were doing really well in recitation. I'm not sure what happened on the exam, but let's sit together and try to figure out. You did this part really well. You just need to figure out how to demonstrate your knowledge on this other part of the exam.

So just a brief story on this. Some of my friends who are professors, parents call them up. Do you know how much tuition I'm paying? Why did my kid not get an A? I have never gotten that phone call here, partly because everybody knows that MIT is a tough place, and so, they don't send their kid with the idea that the money in tuition is guaranteeing any kind of grade. But I did get a phone call from a parent once. And they called me and they said, I just had to share with you this story, it's about my daughter who's in your class.

They said, first exam comes in MIT, and she doesn't do that well. And she calls me, and she's crying, and she's crying a lot. And she said, dad, I really studied. I'm telling you, I really studied. I thought I knew this material, but this was my grade. And I don't know what happened, I really thought I knew it. And she's like, can you come and get me? He's like, the first exam. It's still September, right? And so, he doesn't know what to do, and he says, well,

I'm going to come get you immediately. Let's just see how you feel in a little bit.

So then he gets a call back a few hours later. And you say, Dad! Dad! Dad! My TA emailed me! They said, I know you know the material better than your grade on the test. I told you, dad! I told you that I knew the material better. And the TA knew I knew! I knew I knew the material better! He said, you can come in and talk about test-taking strategies. And so, the dad said, so I don't need to come and get you? She's like, no, I'm good. Right?

So a little bit of the message that that TA sent, saying, I know that you know this better. Let's get together and figure out what we can do. It was everything to this one person. So wise criticism, very helpful. He still said, yeah, that wasn't a good performance, but I you can do better. OK. So I just want to emphasize that no feedback is not a solution. Sometimes having these conversations of criticism, ugh. So the easiest route is say nothing. But that is not a good route. And let me just try to convince you of that.

In doing so, we have some more cool Mary cartoons. And we're just going to leave the classroom for a minute. In this scenario, we have a professor coming in, yelling at this male student, and saying nothing to this female student who is sitting right next to him. So the professor comes in, said, you should have had this done yesterday! I'm giving a talk next week in Texas, and I need to have these PowerPoint slides! Why haven't you finished this experiment? I have to get going! And then he leaves the lab.

And so, in the little blurb here from the female students thoughts he can't hear, she said, I wish she cared as much about my project. It's just not fair. And then the man is thinking, he never yells at the girls like that, and her project isn't going any better than mine. It's just not fair. So the woman is upset about not getting yelled at, which sort of seems counterintuitive at first, until you realize that the one graduate student's getting yelled at because he wants his data for a talk.

So he's never asking the female student for her data for a talk. He's never really talking to her at all about her research. It's not going well, and he doesn't even care. She is apparently so insignificant to him. She's too insignificant, her research is so unimportant, he doesn't even have time to yell at her. He's not interest in yelling at her because he's not going to use her research for anything. He has no expectations that she would ever deliver something that would be talk worthy.

That's at least what's in her mind. Meanwhile, the male professor's very proud of himself for

never yelling at the girls. And the male students are really angry that the girls don't get yelled at, not realizing that he's paying some attention. He actually cares if they're getting results. So this is a lose-lose situation for everybody.

So along these lines I was called on to, at one point, interview all of the female graduate students in the chemistry department, and all the male students in the chemistry department, to figure out how they figured out whether they would apply for academic positions. And I was given this task because the department was very low on the list of the number of female graduate students who were applying for faculty positions. So they wanted to figure out why the women weren't applying. And who better to figure that out than me, a woman.

All right. So I actually was kind of curious to see what people would say. So again, this is not statistically significant. I've collected some data over the years that is statistically significant. This was just conversations that I had, but I just wanted to share this with you. So I asked both men and women, how do you know if you're good enough to be a professor? And both said, I don't know. It was the same. It was the same answer. They both said, I don't know.

And it's like, well, what do you do with that? And the women said, well, I wait for the professor to tell me that I'm good enough. And if they don't tell me, I assume I'm not. The men said, well, I go ahead and apply, and if I'm not good enough, the professor is likely to tell me that at some point. So meanwhile, the professor is saying nothing to either group about whether they're good enough. The women are taking that as a message they're not. The men are saying, I'm just going to go ahead and try until someone stops me.

So no feedback, you might be sending messages you don't intend. I don't think these professors were intending to send message to the female students that they weren't good enough. They just were busy doing stuff and didn't say anything to anyone. So it's a reminder to give feedback to people. Because if there's no feedback, you don't know what the individual is taking away from that. In the absence of it, own insecurities will often come into play. All right.

So other things that one can do is change the narrative. Because, remember, as I was just saying, people have their own insecurities going. And so, sometimes you want to let them know that perhaps other people have had insecurities as well, and that it's OK, and that failing sometimes is not only OK, it's part of the process. So for high achievers, it's important to reassure them that everyone has had difficulty at some point in their career.

So this serves as a counter narrative, this story they're telling themselves, that somehow you have to be perfect all the time to really be successful in science. You don't have to be, but we need to share those stories. The CV, it's a list of successes. It's a list of papers. It's a list of awards. It doesn't say on there, this is what I've done with my career. No. What you've done with your career, between every success are a ton of failures. But we don't list the things that don't work, we just list the things that do work.

Our publications are full of the experiments that work, not the experiments that didn't work. So it's really easy for people to look at someone who's successful and think, they've never had to struggle. It's been super easy for them. They've never failed. And that is just not the case. So if we share those stories with the students, it can help them realize that maybe this bad grade isn't the end of the world. It's all OK. It's part of the process. All right.

So this is the last exercise. So recall a moment where a mentor shared a story with you about a time when he or she struggled with a concept or felt inadequate, but then reached a high level of achievement, or you could recall your own story.

So something that someone shared with you that made a difference, or perhaps something that you could tell your students this semester if they're all of a sudden going, how did I get into this place? I'm not sure that I belong here. What could you share with them that would help them move forward? All right. Find your partners. Think about a time.

AUDIENCE:

I think for a time when-- at least a story that was a counter-narrative for me was thinking about my own struggles in my PhD where there was a long string of failures where it felt like nothing was working and I wasn't really getting anywhere. And it was really hard to see the finish line, and it got me really down. It felt very difficult. I wasn't as happy as I could have been.

And I think what really helped me break out of that was hearing from my own advisor that she had had a pretty long and arduous PhD as well. There was a lot of struggle. And that those failures came in the exact same way, where they're stacking on top of each other. And it just feels like there is no end really in sight, and maybe that you're not even good enough for this. But seeing how far she made it, and how much she succeeded after that really, really reassured me, and makes me feel better about the whole thing.

It makes you realize everything's going to be OK. This is not atypical. It doesn't say something about me, personally. Really what's reassuring is that it feels like everything is really going to

work out at the end of it. And that changed my entire attitude really about my PhD. I feel tremendously better about everything since then.

AUDIENCE: That's very inspiring.

AUDIENCE: Mm-hmm.

AUDIENCE: Yeah, for me, I felt it a lot during undergrad, and I still feel it somewhat in grad school, but one experience was even having an opportunity to participate in a summer program at MIT. So I went to a community college, and my parents couldn't afford to send me to a top-tier university. We didn't have money saved up for me to go to one, and so the advice was to go to community college first, establish your GPA, get some scholarships, and then transfer to a four-year institute.

And while I was at that community college, I didn't feel like I would have any major opportunities to go and do research, especially at an institute like MIT. And I came across the application for the MIT summer research program through another program that I was involved in at my community college. And I was like, OK, I'll just apply to it. They'll probably not accept me or even consider my application, but I'll still do it.

And I did it. I applied. And I ended up getting into the program. And that one opportunity really opened a lot of doors for me, and now I'm able to be a graduate student here. So, yeah, that was a moment where I really felt insecure, and the whole imposter syndrome really affected me. But I'm happy that I took that opportunity. Mm-hmm.

AUDIENCE: Yeah, that's a really awesome story.

AUDIENCE: Thanks.

AUDIENCE: Yeah, so when I started college, I got a really, really bad grade on one of my tests. I think it was actually my second semester of college.

AUDIENCE: OK.

AUDIENCE: I called my dad. And it was the first bad test I've ever had in my entire life. I was so upset. I called my dad and I said, dad, dad, I'm so sorry! I'm failing! And I had a full-ride scholarship, so I thought I was going to lose my scholarship because of one bad test.

AUDIENCE: Yeah, I understand that.

AUDIENCE: And my dad said, no, no, it's OK. It's totally fine. When I was in college-- the same exact college-- I failed miserably my first test in this math class. And I just worked really hard and studied, and tried to talk to people, and made sure that I knew exactly what I was doing. And by the end of the semester, my teacher was like, don't even come in for the final because you're going to break the curve. So you can do it. One bad test is not the end of you.

AUDIENCE: Yeah, that's cool. I wish my--

AUDIENCE: It really helps.

AUDIENCE: Yeah, I can imagine that would really help. Yeah. So I guess, growing up, I didn't have female scientists-- I don't know. The media doesn't really portray female scientists, slash, I didn't know anyone that had a PhD or anything like that. So when I got to college, I knew I was always interested in science, but I didn't actually know what that meant.

And so, I was really lucky enough to have a wonderful mentor in undergrad. And she, was the department head of chemistry, so that was really awesome. But we got really close, and she would tell me about her journey as a scientist, and how she started out becoming a lecturer, and raising a family, and being a woman in science, and what that meant for people's perception, and how she felt like she never really got the respect that she deserved.

And she would always make sure that we referred to her as doctor, because it was the fact that she had worked so hard for it, and had not been taken seriously. So she shared a lot of like how she didn't feel like she got the respect or deserved to almost be in this position of power. But she was an extremely successful scientist, and did wonderful things, and was department head of our at our school. And just really showed me that even if you don't feel like you can do it, or you're not getting the respect, you can still be really successful.

And having those conversations and just hearing her story, made me feel like, OK, I can do this, and allowed me to address like my insecurities. And her support where she felt like I could go to grad school, was a main reason why I felt like I could actually do it. Because she talked about, it wasn't in her plans, but she still like went through it.

And, like, look, I'm a Professor now, even though I don't necessarily feel like I should have been, or could have at times. And so, that was really awesome to hear and really made me feel like grad school was an option before I even got here. And before, I didn't even think about grad school.

AUDIENCE: That's great. I'm so glad that she was able to bring you here.

AUDIENCE: She's wonderful.

AUDIENCE: I think a good example, in my case is my mom. So obviously, her experience is 30 years ago and in Korea, so it might be not that reflective of how things are done in the States right now. But basically, it was a lot harder for her, as a woman, to get a job than her male counterparts, because people were worried that she might quit when she gets married, when she gets pregnant, when she has a baby.

And even after she got a baby and she has continued working in her workplace, she was continuously judged by other people. Because when she worked hard, people were blaming her for not putting in that much of a dedication to her home. But if she was not working hard enough, people were like, why are you like not working hard enough? And you should not pay too much of attention to your kids and your family.

AUDIENCE: You can't win.

AUDIENCE: Yeah, yeah. So she had to put in a lot more time and effort into both her household and in her workplace to fight with the negative stereotype, and not to get blame. So yeah, her story really touched me, and just keeping me aware that those kinds of stereotypes are going out there, yeah.

AUDIENCE: Yeah, I think the one mentor that's really stuck out or has had a big impact on me, especially in grad school, has been my advisor. Especially when I came to MIT, I definitely had a stereotype of what an MIT grad student should be. And it was like, they should only be focused on their academics.

AUDIENCE: Yeah.

AUDIENCE: And I had a lot of personal things I was struggling with that I thought I had to leave behind me when I would come into the workplace. And it almost became this really overbearing burden of, I had to keep this personal side of me a secret and I could only have this academic side of me in public. So having a mentor who is very open about her own struggles, and who's willing to share more about her personal life, made me feel more comfortable bringing my full self to the table when I am in lab. So that's definitely had a big impact on me.

AUDIENCE: Yeah. I feel that the media is gradually changing from showing the typical nerdy scientist into showing that, hey, scientists also have personal lives.

AUDIENCE: Yeah. That they are people.

AUDIENCE: Yeah.

AUDIENCE: Yeah.

AUDIENCE: Yeah, yeah.

AUDIENCE: Yeah, I really like that. So yeah.

AUDIENCE: Cool.

AUDIENCE: Cool, cool.

CATHY L. DRENNAN: So I'll just briefly tell you one story for me, which, if you don't feel comfortable sharing with your students, you can share my stories. That's fine. I have a long list. So one thing that you can tell people which sometimes helps is that professor Drennan is dyslexic. So I was diagnosed in first grade. I was a very smart and articulate kid, and I liked talking to adults. And so, they assumed I was sort of smart, but then I couldn't learn to read.

So I was in the upper group, and then the somewhat lower group, and lower group, and the lowest group, and the remedial group. And it took me to sixth grade until I learned how to read-- second time through sixth grade. I had to do that twice. And so, I was told I would never be able to graduate from high school. And so, when I graduated from high school, then I went to college. And then I was like, ha, ha! Look at me! And then I went to grad school and then I kept going. It's like, oh! Faculty position at MIT! Let's go!

And I just needed to prove that I could do these things, but it was hard. And there are many really embarrassing dyslexic mistakes that I have made over the years too. And when I first started here, I was very nervous about anybody knowing that I was dyslexic, and I have gotten beyond that. So I've now been videotaped by a whole bunch of the dyslexic associations, and done all sorts of different things where I share my stories.

So if you don't want to share a story about something from you, you can share my stories, even if they're my students. I am cool with everybody knowing that I am dyslexic. And if you're my TA, and I write words that are not words on the board, or switch numbers around, just say,

"Professor Drennan, other way," or something like that. That's cool.

So feel free to share these stories. And I think it's so important that students know there's more than one path to success. And that not everyone is the same, and people may struggle with different things. They may have different insecurities, but it's all OK. And those struggles often make us who we are, and that science doesn't work perfectly the first time. We have to get in there and just keep working at it. And the struggles we face in our own life is often just a really good motivating factor for doing some really great research.

All right. So again, you're very welcome to share my stories. I have extra ones, if you want to hear times that I felt insecure. But I heard a lot of discussion, so maybe people feel like they are willing to share a story with us right now? Yeah?

AUDIENCE:

Going off what we were discussing about how in science, so much of what we hear, or what's told to us, is all successes. And also knowing that a lot of those failures, at least for me personally, they kind of come in waves. There's not just one failure at a time. It's a lot.

[SOFT LAUGHTER]

And it really wore on me at the time, but what I think really helped me was my own mentor telling me that she struggled through her PhD. It took a long time. It was a slog. It just reminded me that it's not always a straight line to get to the finish. And more importantly, it's that things will get better. It'll all work out. Everything's going to be OK. And I think that really helped me continuing on to my PhD.

CATHY L.

DRENNAN:

Yeah. Yeah, that's wonderful. Yeah. And I often think of the waves. And it's like things are going really, really well, and then it slows down, and then things are not working. And if the amplitude was up and down and this, it's like, I'll be OK. But often it's up and then down, and then down, and then down, and then down, and then down. And you're like, in other people their amplitudes are different in the lab. And it's like, that person has stuff working. This person has stuff working. What is wrong?

But the thing is that over time, it's like when it's down like this, then when it goes up, it stays up longer also. So it's like getting you there again. So yeah, that's why these stories can be pretty powerful. Anybody else have one they want to share? Yeah?

AUDIENCE:

I think why it's been difficult for me during grad school, especially in the beginning, was that I was dealing with some personal struggles from before grad school and during. And I kind of

felt like I had this burden of keeping it a secret, because I didn't want to come off as overly emotional. Or that because I was dealing with these personal struggles, that I wasn't taking my sciences seriously.

So having a mentor that opened up about how she had also had personal struggles and how she still was able to be successful, was really meaningful to me, to feel like I could be both a person and a scientist.

CATHY L.

Yeah, yeah. Yeah, yeah. It is one package, right? Yeah. We're all a package of these things.

DRENNAN:

So yeah, that's wonderful. And I think that sometimes it just looks to people as if everything is going so well, and they just don't see the inside struggles. And you don't really know, necessarily, what else is going on. And so, when you're comfortable sharing these things, it can be so powerful.

And I feel like sometimes when people are getting through it, it's like, now you have to be a professor because you've got to share these stories with other people. And that figuring out how to deal with the struggle, I mean, that's what it's about. It's not about doing everything perfectly the first time. It's how to deal with failure, get yourself up, get through those times. And that's what gives you the strength to really go after doing hard stuff. All right. Are there any other ones? OK. All right. Let's move on.

The bad news. We all have stereotypes. I think all of you are sitting there thinking, man, let me just count all the different stereotypes I have. We all have stereotypes. We all have unconscious bias. Now, maybe some of you will be like, oh, wait a minute. Why did I react that way? Oh, man! There's another stereotype I have. We all can be victims of stereotype threats or imposter syndrome.

Stereotype threat can be pretty harmful. It can lead to underperformance and a feeling of being judged unfairly. But there's good news. You create an environment of trust in your classroom or in your lab, give wise criticism, and that can really mediate the negative effects of stereotype. If you're part of a team doing something, if someone believes that someone else believes in them-- they're not sure they can do it, but my team believes in me, therefore, I can't do it, because my team is pretty smart.

These are all ways-- and we have to help everyone reach their full potential. The students you'll be working with this semester are crazy, smart, and cool people. And some of them may

be insecure, and you can really help them get to their full potential. And it's an amazing opportunity to teach smart people.

So I hope you have a wonderful time, and I hope that those horses that are dressed like zebras in your classroom are feeling very zebra-ish by the end of the semester. So thank you very much for your attention. I loved the stories you're shared today, and have a wonderful semester.

[APPLAUSE]