



Online Ethics Center
FOR ENGINEERING AND SCIENCE

Diversity, Ethics, and Engineering

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Description

This teaching module is designed to introduce undergraduate engineering students to the ethics of diversity and inclusion in engineering. Diversity equals the human qualities that differentiate us from one another. When we talk about diversity we are talking about characteristics that are potentially stigmatized, or devalued within a specific context. Topics covered in the module include: Stereotype, Prejudice, Discrimination, Implicit Bias, Sexual Harassment.

Body

Module

This module is available in PowerPoint format [here](#).

Instructor's Notes on this Module

Preface

This teaching module has been developed with support from the project “The Ethics of Diversity--Fortifying Ethical Infrastructure to Prevent and Address Sexual Harassment in STEM Research & Practice Settings”, NSF award 1835178. The material described has been tested and evaluated (together with a module on sexual harassment prevention) in the following peer-reviewed paper:

Sabat, I, Evan Nault, Susan Fortney, Martin B Peterson, Debjyoti Banerjee “Diversity, inclusion and equity in the engineering curriculum: Evaluating the efficacy of a new teaching module”, *Advances in Engineering Education*, forthcoming, Volume 11, Issue 3: 54-76, 2023.

Diversity equals the **human qualities that differentiate us from one another.**

When we talk about diversity we are often talking about characteristics that are potentially stigmatized, or devalued within a specific context. For instance, pregnancy can be viewed positively outside of the workplace but negatively within the workplace, especially when combined with certain age, marital, and racial characteristics.

Everybody has identities that can be unfairly stigmatized within a given context, and that’s one of the reasons why everyone should care about diversity.

Stereotype, Prejudice, Discrimination

Stereotype are the Beliefs/cognitions about a group of people (e.g., students in liberal arts (or from UT) are not as smart as those in engineering (or at TAMU)).

Prejudice—Attitudes or affective/emotional reactions towards a group of people (e.g., I feel disgust, contempt, or anger when I meet someone from liberal arts (or UT)).

Discrimination— Differential behaviors/treatment enacted towards a specific group of people (e.g., I ignore, avoid, or ostracize students in liberal arts (or from UT)).

Stereotypes and prejudices can be implicit or explicit.

Implicit Bias

Implicit biases are the automatic stereotypes and prejudices that we hold about certain groups that we do not have awareness of or conscious control over.

These biases manifest and lead to discrimination through a number of automatic, evolutionary processes.

Demonstrating the effects of implicit biases related to race, a famous study was conducted in which researchers sent fictitious resumes to help-wanted ads posted in newspapers. The resumes were identical except for whether the applicants had Black-sounding or White-sounding names. White resumes received a call-back rate of 15% whereas the Black resumes only received a call-back rate of 10%.

Furthermore, this study manipulated job experience and education of these resumes, finding that only White-sounding resumes benefitted from these added credentials. In sum, Black resumes had to have the equivalent of 8 more years of job experience to be comparable to the White resumes!

This study, along with many similar others, shows how implicit biases can impact important job outcomes.

Implicit Bias & Gender

With regard to gender, women earn 81% of what men earn within comparable positions. This gap is even more pronounced amongst women of color, with black women earning 62%, Latina women earning 54%, and Native American women earning 58% of what white men earn. These gaps exist even when controlling for various factors such as industry, occupation type, and education level.

Women are promoted less and “protected” from challenging “stretch assignments”, especially after becoming pregnant or having children. Men, on the other hand, experience a “fatherhood bonus”, and are rated more positively after the birth of a child.

Reduced salaries and barriers to promotion are often seen in a phenomenon known as the glass ceiling effect. This refers to the fact that women experience barriers in achieving top-level positions within organizations. In 2019, only 6.6% of CEO positions at Fortune 500 companies were held by women.

Not only do women face challenges in obtaining these positions, they also experience pushback and resistance to serving in these positions.

One study found that when people are asked to identify the leader of a group from a picture of men sitting around an oval table, they almost always chose the man sitting at the head. When shown an identical picture except with a woman sitting at the head, people usually choose one of the men sitting on the side of the table (Porter, Lindauer Geis, & Jennings, 1983). Thus, women clearly face barriers to being perceived as leaders.

Almost half of all current scientists and engineers are white men. People of color and women are underrepresented, and women of color are especially lacking in these fields. This is likely due to the combination of barriers previously discussed, as well as the intersectional oppressions faced by these groups.

Mental Illness

There are many stereotypes about mental illness. Candidates who disclose their mental illness or psychiatric history when asked are less likely to be hired by companies as managers are more likely to view applicants as unable to do their job. Potential employers consider them to be dangerous, unstable, or manipulative. In a qualitative study, an employer described individuals with mental illness saying ““I find that they need to take baby steps with most of the kids that come through here because let’s face it, they have a mental illness. They don’t process things as fast as a regular person does right?”

This has resulted in a workplace where employees are afraid to seek help or accommodations for their illness. Accommodations for mental illness are usually not intrusive or expensive for employers to accommodate and help employees with mental illnesses better function in the workplace. Some examples of accommodations include an employee taking additional breaks during the day and staying later to work a full 8 hours, reduction of workplace noise through noise canceling headphones, or additional sick leave for doctor’s appointments or therapy.

Of those who disclose their mental illness, 25% of employees report experiencing discrimination.

Within engineering, 25% of students meet the criteria for anxiety or depressive disorders, compared with the general population which has a prevalence of 10%. Engineering has also been reported as the second most lonely profession. Yet, depression rates amongst engineers are actually lower than the average workplace,

with a 4% We are not sure why engineers report a lower rate of depression than engineering students. It could be that depression is underreported or that engineering jobs are less stressful than engineering education. It is also possible that engineers are less likely to seek help. Possible discussion question among students? “Why do you think the rate is so low compared to other jobs?”

Mental illness in the workplace may present differently in different people. On the right are some common ways depression can look to others in the workplace. An individual may not exhibit all of these traits, nor does the presence of these traits necessarily indicate depression. Other mental illnesses or major life stressors may also result in these changes.

The APA (American Psychological Association) recommends using the NOTICE. TALK. ACT. Approach . If you notice these changes occurring and remaining over the course of two or more weeks, ask to talk to your coworker privately and express concern. Provide examples of the behaviors that worry you and be sure to not place judgement on the individual. Connect the individual with your company's employee assistance plan. If you are worried about their immediate safety, do not leave them alone and obtain emergency assistance.

LGBTQ

LGBTQ stands for Lesbian, Gay, Bisexual, Transgender, and Queer. Approximately 4% of the US adult population identify as LGBT.

Although LGBTQ STEM students participate in undergraduate research at a higher rate than their heterosexual counterparts, they have a lower retention rate within STEM, despite the fact that undergraduate research is a significant contributor to STEM retention. This suggests that there are additional factors, such as lab environments and mentorship that can affect LGBTQ STEM student retention.

A qualitative study examining the experiences of LGBTQ+ engineering students revealed certain trends in experiences.

LGBTQ individuals must manage their work identities. The professional socialization process in engineering education presents engineers with the challenge of reconciling their new professional identities with their sense of self. This is particularly challenging for LGBTQ individuals, who must face conflicting expectations of their sexual, professional, racial, and gender identities.

Additionally, LGBTQ individuals may feel isolated when disclosing their identity or passing as straight due to the exclusive behavior their engineering peers may present. Academic and social isolation can cause LGBTQ individuals additional hardships compared to their heterosexual peers. Not only can it lead them to do a groups worth of work by themselves, but it can also keep them from making professional connections that could help them in advancing their career.

Remediation Strategies

Strategies to Reduce Discrimination by Self - How can we stop ourselves from acting on our implicit biases?

Given that most research shows that these biases are quite impervious, we must recognize and do what we can to prevent these biases from manifesting in differential treatment of others. If we don't actively work to do this, we will perpetuate discrimination unknowingly. Here are some strategies to recognize and prevent these biases from impacting our behaviors:

- **Examine diversity in your life:** Look at different aspects of your personal life (friend groups, media/literature that you consume, etc.), how much diversity is there? How could you increase your exposure to diverse groups?
- **Acknowledge and challenge your bias:** instead of looking for things that justify it, look for evidence in people that prove your bias wrong. (e.g., finding members of underrepresented groups that you admire). Recognizing stereotypic responses within oneself and society, labeling them, and replacing them with non-stereotypic responses).
- **Individuation:** Make an effort to see people as individuals rather than a stereotype. Learning about a person makes it easier to recognize them based on their own personal attributes rather than a stereotype. Think about and remember examples of out-group members who counter popularly held stereotypes.
- **Recategorization:** Redefine who is conceived of as an in-group member. View yourself and those not like you as a single superordinate group, rather than seeing yourself as different from the former out-group.
- **Develop an understanding of privilege:** It is important to recognize the ways in which your privilege has impacted your life. For those who do not face discrimination, it can be easy to ignore or consider a thing of the past. It is important to recognize in what ways you are benefitting from a society in which

discrimination occurs. This understanding can help you better advocate for those who do not hold this privilege.

- **Seek education on minority issues:** Actively seek out information about minority issues, listening to others and learning from them. This does not mean listening when someone happens to mention their experiences, but rather to actively seek out this information.
- **Perspective taking:** Adopting the perspective in the first person of a member of a stigmatizing group. Try to build empathy for that group by thinking about how you would feel if you were them. Learn about/listen to their life experiences and think about ways in which you can connect or relate to those experiences.

There are also several strategies we can engage in to privately and publicly support our stigmatized peers.

Privately, we can:

1. Communicate with stigmatized individuals. From small talk to work-related conversations, ensure that potentially stigmatized individuals are included within the workplace.
2. Attend events geared towards minority groups in order to learn about as well as support their issues
3. Support others through their ally development, providing guidance and feedback to support to them
4. Build relationships with minority coworkers. This should not be based on the fact that they are a minority, but rather should be high quality relationships which are mutually supportive and trusting.
5. When someone discloses an invisible stigma, receive it with acceptance and positivity, signaling to that individual that you are an ally.
6. Provide sponsorship, mentorship, and protection to minority employees.
7. Believe and support victims of harassment and discrimination. Not being believed or supported can often cause more harm than the experience itself.

Publicly, we can:

1. Confront all instances of prejudice. Make it clear to both the perpetrator and the target that this is unacceptable behavior. This signals to the perpetrator that their actions are not accepted and signals to the victim that you support them.

Research shows that confronting does impact attitudes and behaviors, even if the perpetrator is uncomfortable or reacts negatively.

2. Call for better organizational laws, policies, and practices. This can include both the actual policies, but also the enforcement of those policies.
3. Educate non-stigmatized coworkers about minority issues. Some individuals are simply unaware of the issues at hand, you can be a good ally by sharing your knowledge with others.
4. Create, facilitate, or participate in workplace diversity groups to discuss issues and implement diversity-related initiatives
5. And lastly, make sure that when you see instances of discrimination or harassment, you report them immediately.

Organizations can also:

1. Hire a formal diversity or EEO officer, and give them real power in the company to make decisions and initiate change.
2. Establish an inclusive diversity council to support this diversity leader
3. Provide means for anonymous feedback, so that individuals who experience discrimination have a way to share that experience without risk of backlash.
4. Address resistance with empathy, facilitate reflection, and educate employees. It is important to meet employees where they are, yet push them towards an inclusive environment.
5. Provide support for targeted individuals. This should include services such as social services, health care, legal services, and professional services.
6. Improve transparency and accountability regarding sexual harassment and discrimination policies. Disciplinary actions must be taken, and organizations should be transparent about how they do this.
7. Emphasize both the business and moral cases for diversity to help employees and leaders understand its importance.

Lastly, organizations and organizational leaders can do the following to reduce discrimination:

1. Organizational leaders should write memos strongly admonishing all forms of discrimination. Make sure this information is clear and readily available. Make sure people know various mechanisms to file complaints and remove barriers to filing.

2. Move beyond legal compliance to address culture and climate. Policies should not be implemented only to ensure an organization is legally protected, but rather to create positive environments.
3. Incorporate diversity into all levels of decision-making. Make cultural and diversity awareness a component of selection, evaluation, and promotion decisions..
4. Take a multicultural vs. colorblind approach. Race is visible, and it is important to recognize the impact that these identities have on our interpersonal interactions and decisions given our the implicit biases. Companies that say they are color-blind often have the most diversity-related prpblems
5. Include diversity training, orientation programs, and focus groups. These should be in person, span several hours and spread across multiple time points, be endorsed and attended by organizational leaders, be integrative and engaging, and be evaluated in terms of pre-post differences in attitudes and behavioral intentions to ensure that they are effective (Kalinowski, 2013).
6. Encourage regular internal and external reviews of all policies, procedures, and practices for addressing discrimination and sexual harassment

Importance of Diversity

Diversity is consistently linked with the following positive outcomes.

1. Education/Learning
2. Improved critical thinking skills
3. Enhanced learning outcomes
4. Individual Performance
5. Improved recruitment & retention
6. Increased job satisfaction
7. Decreased stress
8. Team Performance
9. Broaden employee perspectives (Categorization-Elaboration)
10. Improved creativity and problem-solving (Creative Conflict)
11. Better cross-cultural interactions on global teams
12. Marketability
13. Improved understanding customer needs
14. Able to better reach a wider customer base
15. Fewer costly lawsuits and avoid public backlash due to negative policies or actions regarding diversity

Diversity is an important aspect to any organization. Diversity is also particularly important within engineering. Engineering has a direct & vital impact on the quality of life for all people. As such, engineers need to have the highest standards of honesty and integrity. Moreover, the NSPE states “Engineers shall treat all persons with dignity, respect, fairness and without discrimination.”

Engineers ought to care about diversity and strive to be inclusive, not only because the NSPE stand for it and it brings about good outcomes, but also because it is the right and fair thing to do.

The Uber Case Study

The following is a case study involving a female engineer working at UBER.

“On my first official day rotating on the team, my new manager sent me a string of messages over company chat. He was in an open relationship, he said, and his girlfriend was having an easy time finding new partners but he wasn't. He was trying to stay out of trouble at work, he said, but he couldn't help getting in trouble, because he was looking for women to have sex with. It was clear that he was trying to get me to have sex with him, and it was so clearly out of line that I immediately took screenshots of these chat messages and reported him to HR.”

“I expected that I would report him to HR, they would handle the situation appropriately, and then life would go on - unfortunately, things played out quite a bit differently. When I reported the situation, I was told by both HR and upper management that even though this was clearly sexual harassment and he was propositioning me, it was this man's first offense, and that they wouldn't feel comfortable giving him anything other than a warning and a stern talking-to.”

“I was then told that I had to make a choice: (i) I could either go and find another team and then never have to interact with this man again, or (ii) I could stay on the team, but I would have to understand that he would most likely give me a poor performance review when review time came around, and there was nothing they could do about that.”

Exercise: Take 4 minutes to discuss the following 3 questions:

- 1) What would you have done if you had been the female engineer?
- 2) How should UBER have handled this situation?

3) What were the underlying CAUSES of this problem and what STRATEGIES could UBER use for preventing similar problems in the future?

This case led to a class-action lawsuit against UBER, leading to a \$10 million settlement to 483 plaintiffs. UBER fired 20 employees, including the CEO.

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