Board 180: Impacting Engineering Students' Perceptions of DEI Through Real-Life Narratives and In-Class Discussions with an Empathetic Lens

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Impacting Engineering Students' Perceptions of DEI through Real-Life Narratives and In-Class Discussions with an Empathetic Lens.

Abstract

In today's global workforce, employees must work effectively together in diverse teams. This diversity of demographics on an engineering team results in the essential diversity of abilities and experiences required to develop original and innovative designed solutions to the problems posed to the industry [1], [2], [3], [4], [5] . However, to ensure the team can work together effectively, each team member must feel safe, included, and valued by the team [6]. It is this "psychological safety" as discussed by Edmondson, and the pursuit to mentor students on its importance and how they might contribute to it that served as motivation for the intervention of this study. The intention of the authors was to increase student awareness regarding gender harassment, inequity and the bystanders that watch it happen, through discussions centered on compassion for those who experience harassment or inequities. This was attempted through facilitating classroom discussions focused on clips from the documentary film *Picture a Scientist* [7]. In this documentary, first-hand examples of gender harassment, inequity and bystanders are recounted by the female scientists who experienced them. Several impactful clips were selected from each topic (harassment, inequity, and bystanders) and grouped together to create three separate videos which were assigned to students to view and on which to reflect. Students' reflections were guided by several prompts, to which their responses were submitted as an assignment prior to the in-class discussion. The clips were then discussed over two class sessions. A final reflection was also assigned with prompts focused on why these topics were discussed in an Introduction to Engineering course and how it might have impacted the students' perceptions of these topics. A 16-question survey was developed by the authors and modeled after the Balanced Emotional and Empathy Scale (BEES) [8]. The survey was given both prior to and after the intervention, providing a quantitative measure of the intervention's impact on students' perceptions of what constitutes gender harassment, inequities, and bystanders. Reliability analysis on the survey shows a high Cronbach's alpha score of 0.84 based on two factors. Initial results show that students' perceptions/understanding of 1) what constitutes professional treatment of their colleagues and 2) the current level of gender equity in the STEM industry can be positively impacted by the proposed intervention. The impacts were greater in the male population. Responses to all reflection prompts will be qualitatively analyzed for emergent themes and to identify any themes resulting in the largest impact on shifting students' perspectives in a follow-up paper.

Background and Motivation

While diversity in the engineering profession has shown some improvement over the last decade, such as in Civil Engineering [9], retention of women and other minorities continues to be a struggle [10], [11]. As the study by Francis and Michielsens verified, inclusionary practices in the workplace are crucial for the retention of women. For an engineering team to function effectively, each team member must feel safe and welcome to voice their opinions and confidently complete their own tasks. As an educator in undergraduate engineering courses for over two decades, it has become apparent to the authors and verified in studies that student confidence and feelings of belonging have profound impact on their ability to function

effectively on a team [6]. While faculty may have some control over behaviors inside their classroom, it is the student behavior outside of the classroom and in the industry that are of greatest concern since they are no longer under the influence of their faculty. How do faculty facilitate students' understanding of the importance of inclusion? How do we convince students that being inclusive has an important impact not only on the individual teammate, but on the performance of the team as a whole?

Additionally, the retention of engineers in the workforce, particularly those who identify in one or more of the minoritized populations in engineering, is crucial to the health of the industry [12]. Indeed, industry leaders interviewed as a part of study indicated that with the fourth industrial revolution upon us, it is imperative that engineering employers attract and retain "people with the right mindset and getting that spread of expertise and personality is becoming more challenging".

It is for these reasons that the need for diversity and equity discussions in STEM classrooms is just as critical now as much as at any previous time. The marketplace is global; professionals find themselves working with a diverse population of colleagues and clientele, and yet engineering classrooms are still virtually devoid of discussions or training centered on how to be effective on a diverse team or how to create an equitable environment despite this need [13]. In a study focused on the impact of faculty-student interactions on students' perceptions of and attitudes towards DEI, it was concluded that faculty attitudes and behaviors impact those same attitudes and behaviors in students, including towards such concepts as valuing diversity, equity, and inclusion [14]. If positive changes in perceptions and attitudes towards DEI are desired, it is critical that these sorts of discussions are initiated and rooted in empathy [15] and initiated in the classroom. Similarly, as suggested by Bielefeldt, when students are exposed to actual engineering ethics scenarios and learn of the impacts to those involved, their awareness and reasoning are positively affected, showing promise over the more common engineering ethics teaching practices of studying hypothetical scenarios [16].

One barrier to more widespread implementation of such discussions is faculty level of professional preparation or comfort to facilitate these discussions [17]. As noted in a study analyzing the types, frequency and effectiveness of DEI-related conversations high school teachers were having with their science and math students, the prominent challenge was the feeling of not being well-prepared [18]. There is also some concern with a potential negative backlash that could occur if the conversations are not appropriately guided [19]. As students are suddenly exposed to DEI discussions and become aware of unintended inequities suffered by minority populations, feelings of shame or even perceived loss of status/privilege can materialize as disruptions to the discussion that are counterproductive. As noted in the Rottman article, it is critical that the discussion tone "shift from rational argumentation to respectful dialogue by including mindful listening activities". The cautionary tale described in the Rottman article served as guidance in this study's development.

To address these issues, an intervention was proposed to reframe DEI as a central tenet of ethics and professional responsibility for the 21st century engineering workforce. Several professional engineering organizations (e.g., American Society of Civil Engineers (ASCE) and American

Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE), Association for Computing Machinery (ACM), and American Institute of Chemical Engineers (AIChE)) have adopted language in their codes of ethics that speak directly to DEI issues [20]. For example, the ASCE Code of Ethics asserts that practicing engineers should "treat all persons with respect, dignity, and fairness, and reject all forms of discrimination and harassment; [and] acknowledge the diverse historical, social, and cultural needs of the community, and incorporate these considerations in their work." [21]. ASME's Society Policy 15.9 outlines broad expectations for its members to refrain from all discriminatory behavior based on race, ethnicity, gender, sexual identity, and sexual orientation and is codified in fundamental canon 10 per their most recent code of ethics update in 2021 [22].

A major challenge for engineering educators is understanding how best to introduce and discuss DEI topics with undergraduate students. Pointing out elements of professional codes of ethics and establishing them as expectations for behavior is certainly a good starting point. However, students may lack a deeper understanding of the lived experiences within minoritized groups that establish the need for these codes and policies in the first place. It was this lack of awareness and the clear need for empathy that provided the impetus for the intervention to help fill a gap in industry need and educational outcomes [23]. To provide this motivational context, the institution where the intervention was implemented has the following student demographics within its College of Engineering: 77% male, 23% female; 61% White, 15.7% Hispanic/Latinx, 5.9% Asian and 3.9% Black.

This research is closely related to ongoing work with critical narrative for teaching ethics and professional responsibility in engineering by colleagues at the same university. The focus has been entirely on senior engineering students to examine how critical narratives impact students' abilities to assess the broader impacts (social, economic, and environmental) of engineering work. Results from this work suggest that students respond well to narratives that engage them in critical thinking [24]. It is anticipated that extending this type of pedagogy to the first-year level in the Introduction to Engineering course will help students better connect with DEI issues and understand its significance in the STEM professions.

Intervention

The proposed intervention was based on video excerpts from the recent Nova documentary, *Picture a Scientist.* This film explores the challenges faced by women in STEM fields through the recounting of experiences of several female scientists. The excerpts served as a starting point for conversations in the classroom. By exposing students to the lived experiences of others who have experienced sexual harassment and discrimination *in the context of their professional work in STEM*, it was anticipated that this would: (1) develop empathy within the majority student population, and (2) provide minoritized groups with additional reference points to help them navigate the current culture of the engineering profession. In striving for the second goal, there could also be the additional benefit of reduced attrition from minoritized groups through the display of faculty advocacy and support by simply facilitating these discussions [25]. The intervention supplemented the current Introduction to Engineering Ethics Module. Ordinarily, the Ethics module in the course presents several hypothetical case studies for the students to

analyze using the NSPE (National Society of Professional Engineers) Code of Ethics. The typical topics include working outside one's area of expertise, violating proper protocol in terms of report revisions and oversight, public safety, etc. To incorporate topics of harassment, equity, and bystanders into the study of Ethics and Professionalism, an additional module was created and implemented in four sections of the Introduction to Engineering course (average section size of 25 students) in the fall 2022 semester. The implementation of this additional module was executed mid-semester to ensure some level of rapport had been established between the students themselves and between the professor and students. Additionally, the faculty implementing the intervention maintained a journal to aid future adopters as they lead their own sections of first-year engineering students through this endeavor.

The intervention comprised several tasks that the students were required to complete. As these tasks were required as part of the course, a review of the IRB (Institutional Review Board) deemed this study exempt, however, students were still required to consent to opt-in to allow the use of their data. The disclosure and consent acquisition process were completed before the intervention's first task.

Before any discussions, explanations or assignments were provided to the students, they were required to complete a 16-question pre-survey (see Table 1). The survey was developed by the authors to create some baseline quantitative measure of how students perceived harassment and inequity (what constitutes either) and how they think they might respond in certain situations. The survey was modeled after the Balanced Emotional and Empathy Scale [8] with similar simplistic wording but focused on the three themes of harassment, equity, and bystanders. The original survey contained 18 questions balanced between the three themes and with equal positively and negatively worded questions; however, two questions were removed due to their ambiguity, resulting in the final 16 item survey. To evaluate the reliability of the survey, several other Introduction to Engineering sections not involved in the intervention were also given the survey to increase the survey sample size. These students also provided consent for the use of their data. In total 175 students (n=175) responded with consent to the pre-survey. This compares to 64 (n=64) of those students participating in the intervention.

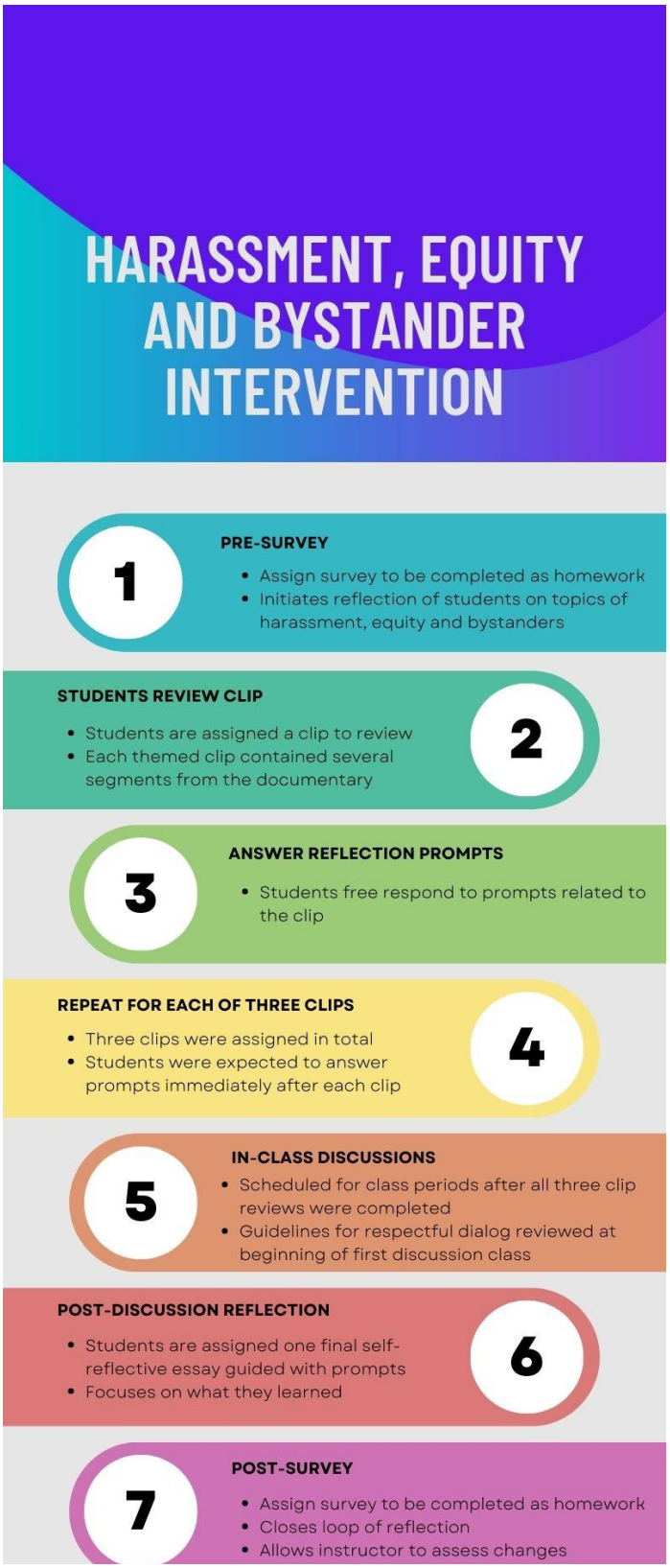

Figure 1: Infographic on the Studied Intervention Steps and Timeline

The primary tasks of the intervention were to review the three sets of clips from the documentary, with each clip set focusing on one of the three themes (harassment, equity, bystanders). The first set of clips focused on harassment and featured narratives of Dr. Nancy Hopkins (MIT) and Dr. Jane Willenbring (Stanford). The clips illustrate examples of sexual harassment and gender hostility. The second set of clips shared narratives of inequity from Dr. Raychelle Burks (American Univ.), Dr. Sangeeta Bhatia (MIT) and Dr. Corrine Moss-Racusin (Skidmore). The theme of the third set of clips centered on bystanders and revisited Dr. Willenbring's story through the perspective of Dr. Adam Lewis (NDSU). After viewing each clip set, the students were then required to compose responses to several prompts and submit them as assignments (see Table 2). The intention was to facilitate their reflection on the clips and form their opinions prior to class. This exercise aided them in identifying the behaviors related to the distinct themes and articulate their emotional responses to what they observed. The clip reviews and reflection assignments were all completed as an assignment outside of class time. After the due date for the final clip review, the in-class discussions were then conducted, moderated by the instructor on each clip set with new, but related, prompts. Tables and chairs were arranged in such a way that students were primarily facing one another rather than only forward, toward the instructor. In the data-collection implementation of this intervention (fall 2022), the in-class discussions spanned two 50-minute class sessions. After the final in-class discussion, a summarizing reflective essay, with separate prompts, was assigned. The focus of the prompts in

this reflection assignment were on the motivation and importance of the new module, what students learned and how their perceptions may have changed. The final step in the intervention is the post-survey, which included the identical question set from the pre-survey. While the survey was initially developed for data collection, it became clear it was a useful tool for students to self-reflect and for the instructor to quantify impact, if any. As a result, it is now a permanent step in the overall intervention. The infographic in Fig. 1 illustrates the intervention process.

Table 1: Survey Questions (Pre and Post)

Question #	Question
1	Gender should not be a factor when determining someone's pay.
2	If I overheard an offensive joke/comment about someone else, I would say something to those involved.
3	If an offensive joke/comment isn't aimed at me, I would keep quiet (ignore it).
4	Saying an offensive joke/comment (in front of those about whom the joke/comment is made) isn't a form of harassment.
5	It is not okay to assign teammates certain 'roles' (traditionally associated with their gender) based on their gender.
6	Asking a co-worker out on a date, while at work, is fine so long as there isn't a policy against it.
7	Repeatedly asking a co-worker out who has declined each time is a form of harassment.
8	When cis or transgendered women are paid less than cisgendered men in the same role at the same company, I'm sure it is because of a valid reason like less experience, inferior performance, etc. (cisgendered means gender identity corresponds to gender at birth).
9	I don't think there really is a pay gap.
10	If I were to witness a female colleague being treated unfairly due to her gender, I should report it to a supervisor or HR representative.
11	Posting gender-based, negative comments online is a form of sexual harassment.
12	Discussing a co-worker's physical appearances at work with others is inappropriate (whether or not the person you're discussing can hear you).
13	If I overheard such discussions (as stated in previous question), I would likely complain to my supervisor or HR representative.
14	Women (cis or trans) have equal access to management positions as their cis-male counterparts.
15	I do not believe I've ever witnessed any form of gender bias.
16	I cannot imagine that professionals would act any other way besides professionally.

The survey questions are provided in Table 1 above; the prompts for each clip set and the final reflection are provided in Table 2 below. The survey responses were on a 7-point Likert scale, with the options: Strongly Agree, Agree, Slightly Agree, Neutral, Slightly Disagree, Disagree,

and Strongly Disagree. There was also an "I don't know" option for those who did not want to answer certain questions or were unsure how to respond.

Table 2: Prompts for Each Clip Set and Final Reflection Assignments

Clip Review and Reflection Prompts (completed while watching videos independently outside of class and before the in-class discussion)	
Clip 1	1) Referring to the first video, describe what specific actions/behaviors constituted harassment, and which character was responsible for those actions/behaviors. 2) Explain why those actions/behaviors are a form of harassment. 3) How do you believe this affects the person experiencing the harassment? 4) What do you think may have driven the behavior of person responsible for the harassment? 5) What is your personal reaction to the situations depicted in the video?
Clip 2	1) Referring to the video, identify at least 3 examples of gender inequities that were discussed. 2) For someone affected by these experiences, how might that effect their work environment? 3) How might it change their self-perception? 4) How might gender inequity occur in a university setting? 5) Either based on your own knowledge, or based on what you've learned in the clip, how pervasive of an issue do you believe this to be?
Clip 3	1) Referring to the video, describe the example of a bystander scenario. 2) Explain what you believe motivated them to act as bystander(s). 3) What are other reasons people might act as a bystander? 4) Describe what the bystander(s) could have done differently (in the clip) to help ensure a safe, equitable and professional workplace. 5) If you had been in the bystander(s) shoes, do you think you would recognize what was happening at the time it happened and know what to do? (Explain your answer; do not simply state yes or no). 6) What do you know about Title IX in general? 7) Whom do you contact on campus for Title IX related concerns?
Summarizing Reflective Essay Prompts (assigned after in-class discussion)	
	Your EGR101 class just participated in a week-long study of gender inequity, harassment and bystander issues in the engineering/science workplace. Why do you think these topics were covered in your EGR101 class? What did you learn about each of the three topics (harassment, equity and bystander)? How, if at all, have your perceptions/understanding of these three topics changed as a result of watching the video clips and participating in the class-discussions?

The preceding table (Table 2) displays all the prompts for the three clip sets and the final self-reflection assignment. The first clip contained excerpt narratives surrounding harassment, the second clip contained excerpts themed around equity (or inequity) and the third clip's excerpts focused on bystander effect.

Results and Analysis

The total sample size of students participating in the study was 175. One student was removed due to many "I don't know" responses yielding a total N = 174. This population was then subdivided into a study group (SG, N=64) that participated in the intervention and a comparison group (CG, N=110) that only completed the pre-intervention survey. Population statistics and demographic information are provided in Table 3 and summarized graphically in Figure 2. The distribution by ethnicity was relatively uniform across SG and CG with 67% identifying as White – Non-Hispanic, 6% Black or African American, and 11%-16% White – Hispanic/Latinx/Spanish origin. There was, however, a significant variation in gender distribution with 41% identifying as Female in SG and only 17% Female in CG. Only one student identified as Non-Binary.

Table 3: Population Statistics

	Study Group	Comparison Group	Total
	64	110	174
Gender			
Male	38	90	128
Female	26	19	45
Non-Binary	0	1	1
Ethnicity			
White - Non-Hispanic	43	74	117
White - Hispanic/LatinX/Spanish	7	17	24
Black or African American	4	7	11
Asian	6	8	14
None of the above	3	2	5
Prefer not to answer	1	2	3

Results for the current paper are limited to the survey. First, the discussion will focus on the overall validity, reliability, and descriptive statistics using combined results from SG and CG since both groups completed the survey at roughly the same time in the semester and prior to the intervention. Next, pre-vs. post-intervention survey data for the study group will be analyzed to provide preliminary insights into the impact of the intervention. Future work will include qualitative and mixed-methods analysis using the SG participants' responses to the focus questions and the pre- vs. post-intervention survey data.

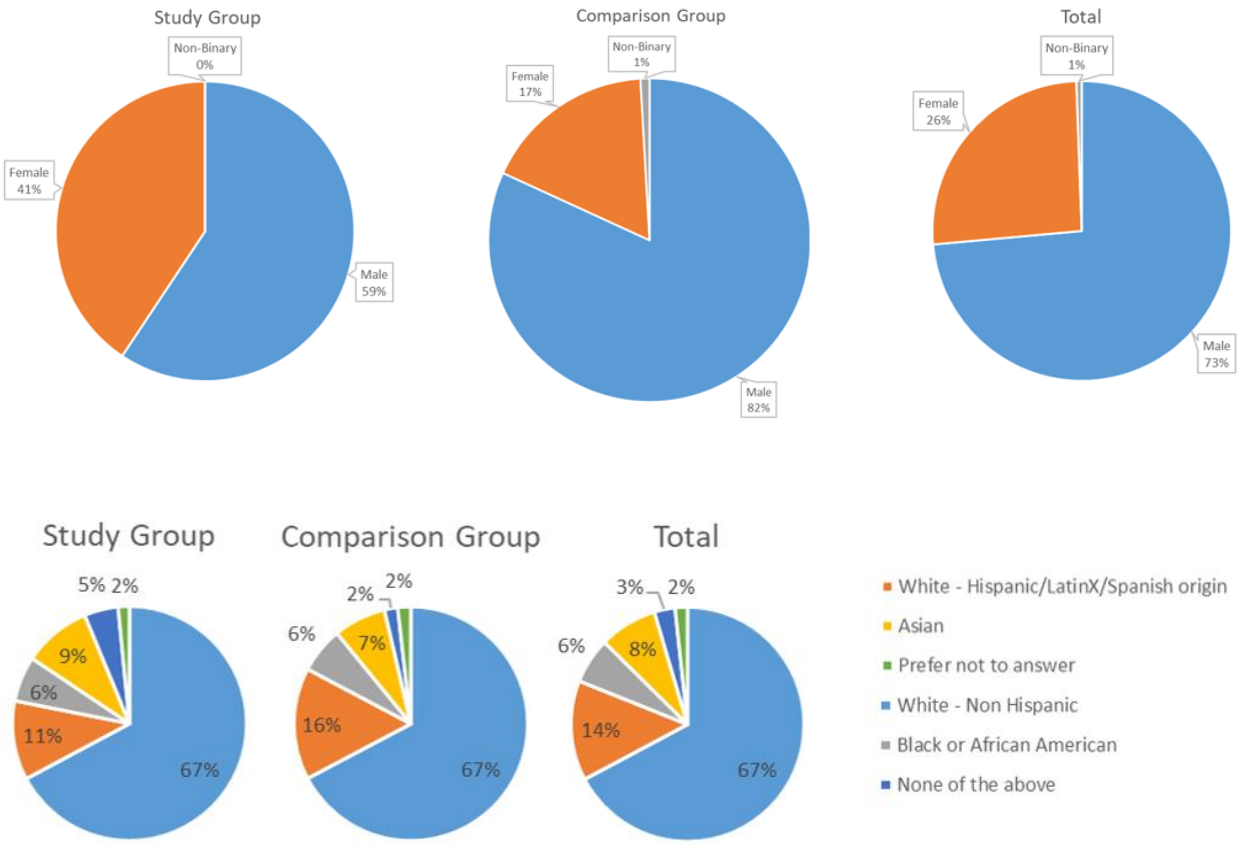

Figure 2. Graphical representation of gender and ethnicity.

Pre-Intervention Survey: Reliability and Factor Analysis

An initial reliability analysis was completed using the three original constructs (Harassment – H, Equity – E, and Bystander – B). Results for each construct provide a moderate degree of reliability with Cronbach's alpha values of 0.626, 0.701, and 0.651 for H, E, and B, respectively, considering a typical threshold value for reliability of 0.7. However, the Cronbach's alpha result for the total scale was 0.84, revealing high reliability for the survey when disregarding the three categories.

Next, a factor analysis was completed to establish validity and group questions according to common themes based on responses. The first step was to perform a principal component analysis (PCA) to extract the eigenvalues associated with each component. These values are provided as a Scree Plot in Figure 3. The resulting plot indicates that a two-factor model is appropriate. Next, the rotated component matrix was established using Varimax with Kaiser Normalization and convergence was achieved in three iterations. The first component identified through this analysis contained eight items, but only six items had a loading value greater than 0.5. These questions focused primarily on the way that colleagues should/shouldn't be treated in a professional environment. In the subsequent discussion, the six questions in the first component with loading values greater than 0.5 are grouped into a question category labeled "ToC" for "treatment of colleagues". The second component contained five questions that generally focused on issues related to gender equity. All five items have loading values greater

than 0.5. These questions are grouped into a category labeled “GE” for further analysis and discussion. Finally, two questions were identified that did not load onto either factor. Loading values, mean and standard deviation results are provided for all 16 questions in Table 4.

Table 4. Rotated component matrix indicating question grouping by common theme

	Factor Component			
Question	1 (ToC)	2 (GE)	Mean	Std. dev.
Discussing a co-worker's physical appearances at work with others is inappropriate (whether or not the person you're discussing can hear you).	0.699		5.76	1.40
If I overheard an offensive joke/comment about someone else, I would say something to those involved.	0.689		4.86	1.48
Posting gender-based, negative comments online is a form of sexual harassment.	0.679		5.40	1.66
Saying an offensive joke/comment (in front of those about whom the joke/comment is made) isn't a form of harassment.	0.66		5.57	1.48
If I overheard such discussions (as stated in previous question), I would likely complain to my supervisor or HR representative.	0.658		4.60	1.65
If an offensive joke/comment isn't aimed at me, I would keep quiet (ignore it).	0.575		4.62	1.48
It is not okay to assign teammates certain 'roles' (traditionally associated with their gender) based on their gender.	0.484		5.40	1.98
If I were to witness a female colleague being treated unfairly due to her gender, I should discuss it with a professor, residence hall advisor or other appropriate figure to determine the best response.	0.469		6.04	0.91
Gender should not be a factor when determining someone’s pay.	0.42		6.07	1.92
Women (cis or trans) have equal access to management positions as their cis-male counterparts.		0.749	3.47	2.00
When cis or transgendered women are paid less than cisgendered men in the same role at the same company, I'm sure it is because of a valid reason like less experience, inferior performance, etc.		0.657	4.51	2.19
I cannot imagine that professionals would act any other way besides professionally.		0.654	5.11	1.84
I do not believe I've ever witnessed any form of gender bias.		0.646	5.23	2.13
I don't think there really is a pay gap.		0.616	4.51	2.19
Asking a co-worker out on a date, while at work, is fine so long as there isn't a policy against it.	--	--	5.57	1.48
Repeatedly asking a co-worker out who has declined each time is a form of harassment.	--	--	6.17	1.10

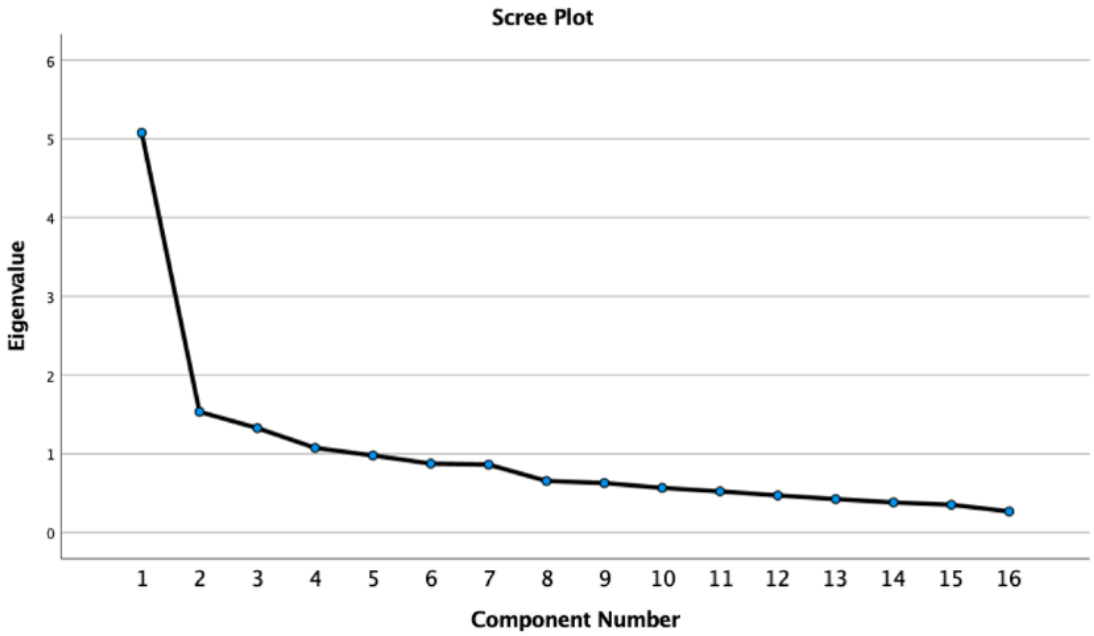

Figure 3. Eigenvalues extracted from PCA

Pre-Intervention Survey: Differences between Groups

The dominant demographic factor observed in the pre-intervention survey results was gender. Highly significant differences were observed in the grouped results for the ToC and GE factors. The average ToC score for male students was 4.95 and the average ToC score for female students was 5.75 ($p<0.01$). The difference was even larger for the GE factor with male students averaging 4.20 and female students averaging 5.6 ($p<0.01$). Histogram distributions grouped by gender for each factor are provided in Figure 4.

Table 5: Comparison of means by factor (grouped by gender)

	Male			Female			
Factor	N	Mean	Std. dev.	N	Mean	Std. dev.	p-value
Treatment of Colleagues	128	4.95	1.10	45	5.75	0.50	8.67E-06
Gender Equity	128	4.20	1.22	45	5.60	1.09	2.0E-10

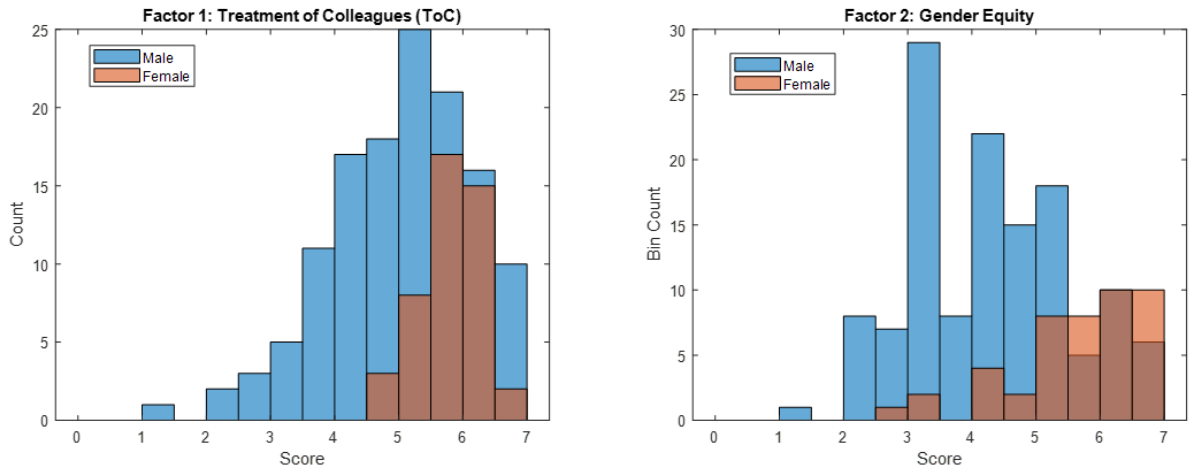

Figure 4. Histogram results for Treatment of Colleagues and Gender Equity with grouping by gender

Results from the pre-survey did not reveal any significant differences between mean response for ToC or GE based on ethnicity. Due to the relatively small sample size for groups who identified as anything other than White – Non-Hispanic, the analysis was completed by comparing means for majority vs. all minority groups. The histogram distributions for both groups are similar (Figure 5) and the large p-values (p=0.39 and p=0.49 for ToC and GE, respectively) do not indicate any significant difference based on grouping by ethnicity (Table 6 and Figure 5).

Table 6: Comparison of means by factor (grouped by ethnicity)

	White – Non-Hispanic			All Minority Groups			
Factor	N	Mean	Std. dev.	N	Mean	Std. dev.	p-value
Treatment of Colleagues	117	5.12	1.02	57	4.52	1.34	0.39
Gender Equity	117	5.27	1.07	57	4.67	1.29	0.49

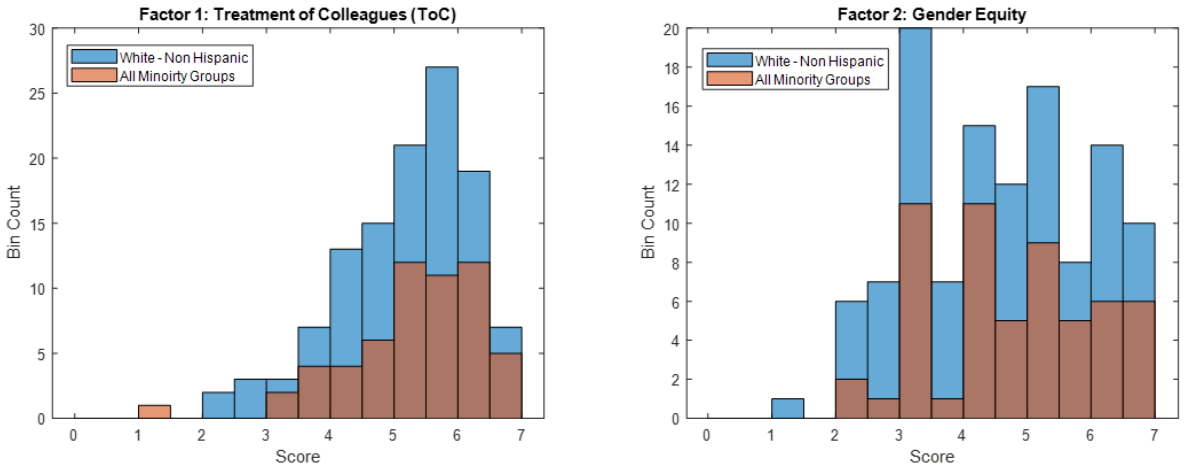

Figure 5. Histogram results for Treatment of Colleagues and Gender Equity with grouping by ethnicity

Pre vs. Post Survey Analysis

The objective of the pre vs. post analysis is to evaluate the impact (if any) of the intervention. First, comparison of means was completed for both factors, ToC and GE, for the entire population of the study group (SG). The means were also compared for gender sub-groups since gender was identified as a significant characteristic of the population during the analysis of the pre-survey data.

When all participants in the study group are considered (N=64), the post-intervention means for ToC and GE factors increased by 0.36 and 0.29, respectively (Table 7). Because we are working with the same population and expect the intervention to increase the scores on the survey results, a one-tailed t-test was used to evaluate the probability that the difference in means is statistically significant. Means for both factors experienced significant increases after the intervention ($p<0.01$). For male participants (Table 8), the increase in means was slightly larger with increases of 0.44 and 0.47 for ToC and GE, respectively ($p<0.01$). For female participants (Table 9), a smaller, but still significant ($p<0.05$), increase of 0.26 was observed for Factor 1 (Treatment of Colleagues). For Factor 2, Gender Equity, the increase in means from pre to post was only 0.03 and not found to be significant ($p=0.81$). Histograms for all pre vs. post results are provided in Figure 6.

Table 7: Pre- vs. Post-intervention: comparison of means by factor (all participants)

	Pre-Intervention (All)			Post-Intervention (All)				
Factor	N	Mean	Std. dev.	N	Mean	Std. dev.	p-value 2-tailed	p-value 1-tailed
Treatment of Colleagues	64	5.34	0.86	64	5.7	0.70	0.0095	1.94E-6
Gender Equity	64	4.84	1.32	64	5.13	1.23	0.20	.0036

Table 8: Pre- vs. Post-intervention: comparison of means by factor (male participants)

	Pre-Intervention (Male)			Post-Intervention (Male)				
Factor	N	Mean	Std. dev.	N	Mean	Std. dev.	p-value 2-tailed	p-value 1-tailed
Treatment of Colleagues	38	5.03	0.91	38	5.47	0.72	.022	1.6E-5
Gender Equity	38	4.23	1.22	38	4.70	1.20	.094	9.2E-4

Table 9: Pre- vs. Post-intervention: comparison of means by factor (female participants)

	Pre-Intervention (Female)			Post-Intervention (Female)				
Factor	N	Mean	Std. dev.	N	Mean	Std. dev.	p-value 2-tailed	p-value 1-tailed
Treatment of Colleagues	26	5.78	.56	26	6.04	.50	0.09	0.03
Gender Equity	26	5.73	.88	26	5.76	1.02	0.91	0.81

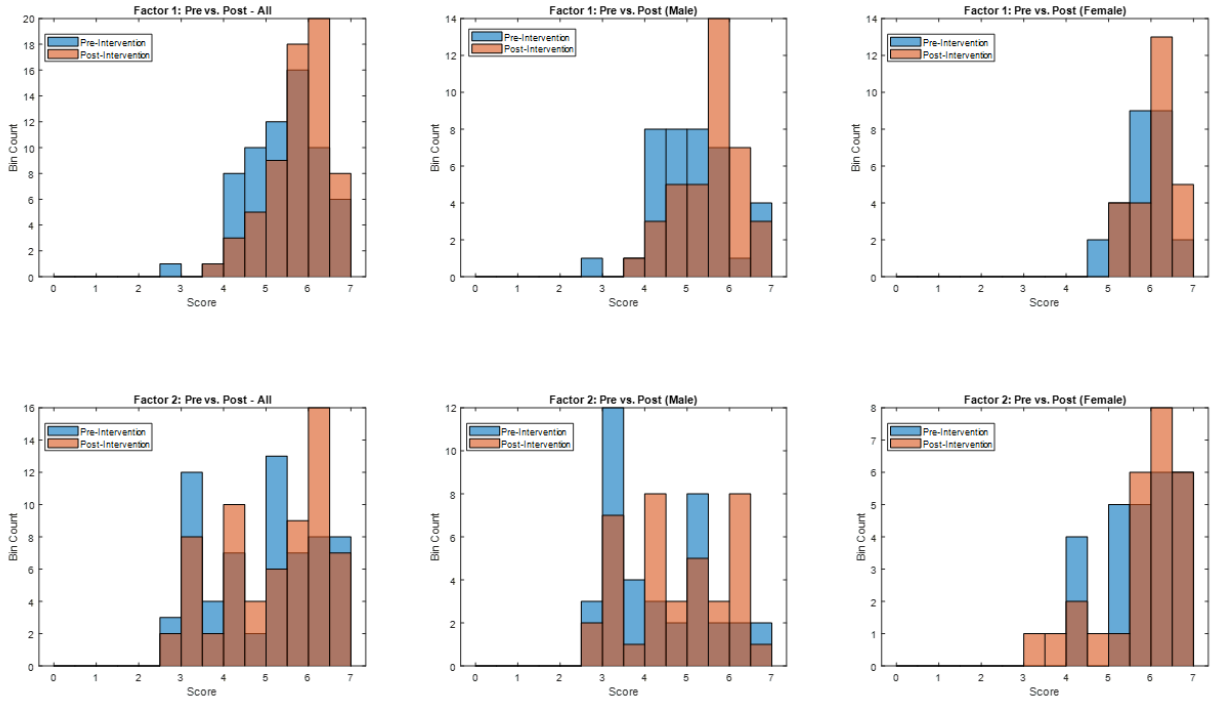

Figure 6. Pre vs. Post histogram results for Factor 1 (ToC) and Factor 2 (GE) with grouping by gender

Summary, Conclusions, and Future Work

The intervention, having been implemented for the first time during which data was collected for study (fall 2022), was deemed successful, with room for refinement. The data show that viewing and reflecting on personal narratives from actual people can shift perceptions of what constitutes professionally acceptable behavior. The shifts in perceptions were not affected by ethnicity but were by gender. The majority of the study group population identified as male; however, the study group female-identifying population was uncharacteristically high for a group of engineering students at 41%. Students self-selected into the sections of the course that comprised the study group without prior knowledge of the study. No students in the study group identified as non-binary nor did any choose to not answer the gender demographic question.

Considering the pre-survey data on its own, it is observed that males and females scored differently for both factors. The difference in the mean score (on the Likert scale that went from 1 to 7) for the 'Treatment of Colleagues' factor (ToC) was smaller (M=4.95, F=5.75) than it was for the second factor, 'Gender Equity' (GE) with results of M=4.2, F = 5.6. The difference in means of 1.4 on perceptions of the level of gender equity in the STEM field underscores the importance of having these discussions.

In analyzing the pre and post survey results for the study group (SG), the biggest improvement was observed for males on the GE factor with a shift of 0.47. Only the male population saw a significant shift in this factor after the intervention; this can likely be explained by the already high data values the females had in this category prior to the intervention (5.73). Both the female and male groups saw positive change in the ToC factor after the intervention, with the shift slightly stronger for the male population (M = 0.43, F = 0.26). Again, the female pre-survey mean on this factor was already high, so observing a statistically significant ($p < 0.05$) shift in this category demonstrates the intervention's effectiveness in producing a positive change in attitude towards advocating for equity and against harassment.

The authors of the study believe that viewing the excerpts from the documentary, *Picture a Scientist,* reflecting on how those clips made them feel and then discussing those opinions based on guided prompts in class, provided the context needed for these young, professionals-in-training to reconsider their own pre-conceived notions of harassment, equity and bystanders. In some cases, hearing directly from their peers on first-hand stories added to the likelihood of empathy to play a role in the recalibration of their perceptions.

In a follow-up paper, the authors will analyze the reflective responses to the three sets of clips and the final reflection assignment after the students completed the intervention's in-class discussions. It is anticipated that the students' responses will 1) further confirm the identified factors (Treatment of Colleagues, and Gender Equity) as the two main factors that shape one's perceptions of harassment, equity and bystanders, if not 2) add nuance to the understanding of these factors. Additionally, as part of the study, the author that implemented the intervention maintained a journal of concerns and lessons learned both before and after the intervention was completed. These will also be summarized and discussed, with emphasis on how the authors' perceptions of students did or did not parallel with students' response themes and identify the primary lessons learned in the roll out of this intervention. Finally, the intervention was again

implemented in the spring 2023 and spring 2024 semesters by the same author. Though data was not collected during the subsequent semesters' implementations, the author can share refinements made to the intervention and their additional lessons learned from the subsequent implementations.

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