Perspectives from Academics and Practitioners on The Integration of DEI in Engineering Codes of Ethics

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***Abstract*—This full research paper explores how academics and engineering professionals view the incorporation of DEI into engineering ethics codes. Engineering professional societies have integrated DEI explicitly or implicitly into their codes of ethics. Yet, DEI is contested and even banned in many institutions of higher education in the US. Thus, there is a need to understand the relationship between ethics and DEI in engineering, including how engineering practitioners and scholars view DEI should be canonized in the profession. In this study, we addressed two research questions: (1) "To what extent and in what ways did participants view it to be important to incorporate DEI into an engineering ethics code?" and (2) "How do participants view the incorporation of DEI into the IEEE code of ethics?" The research methodology included a qualitative analysis of interview responses from engineering academics and practicing engineers regarding the integration of DEI into engineering codes of ethics, as well as their perceptions of IEEE's current code of ethics. We conducted semi-structured interviews with 25 engineering faculty members and 25 engineering practitioners between June 2022 and April 2023. During interviews, we shared the IEEE code of ethics and asked participants to share their perspectives of the code. Participants felt that embedding DEI principles into engineering ethics codes was important to ensure equitable treatment, access, and representation across all levels of the profession. Many participants felt that ethics codes should have a more concerted focus on DEI and DEI principles, whereas some participants questioned whether DEI should be within an engineering ethics code at all. Findings from this study can inform future innovations at the nexus of ethics and DEI. We specifically hope this work will encourage professional societies to continue integrating DEI within engineering codes of ethics with the undergirding confidence that many stakeholders across both engineering and academic communities are supportive of such integration.**

Keywords—engineering ethics; diversity; equity; inclusion; qualitative analysis

I. Introduction

Weston & Fischer [1] suggested that "to think or act ethically is to take care for the basic needs and legitimate expectations of others as well as our own" (p. 3.) Herein, "basic needs include things like food, clothing, shelter" and "sustenance" (p. 6). Legitimate expectations suggest that we all have a right "to be treated with respect and as equals" (p. 7). Despite this common starting point for ethics (which emphasizes equality), "There are a variety of views within ethics about how to think about legitimate expectations" (p. 7). For Weston and Fischer, ethics occurs whenever conflicts manifest regarding competing views about legitimate expectations, how they ought to be met, and by whom. As a result, Weston argues that "the main point of studying ethics is to learn how to engage with ethical values and issues in more critical, systematic, and effective ways" (p. 8).

Like the phenomenon ethics itself, there are numerous and sometimes competing views on what constitutes ethics or how best to study it within a profession, such as engineering [2]. According to Herkert [3], "Engineering ethics can be viewed from three frames of reference—individual, professional and social" (p. 375). The individual frame of reference asks how one would like to act based on their own values; the professional frame of reference draws attention to how engineers ought to act; and the social frame of reference draws attention to how society would like an engineer to act. Values that manifest across the three frames of reference might yield incongruous values and perspectives. Thus, connecting Herkert's [3] three frames of reference with Weston & Fischer's [1] definition of ethics, engineering ethics involves engaging with conflicting values in "critical, systematic, and effective ways" [1].

Herkert [3] connected a two-part framework of micro- and macro-ethics to these three frames of reference and within the context of engineering. Here, micro-ethics draws attention to how an individual engineer ought to conduct themselves,

including but not limited to their professional obligations. Conversely, macro-ethics draws an engineer's attention to social considerations by a "broadening of the context of ethical decisions" and by "including consideration of social values and multiple stakeholders" (p. 380). Thus, micro-ethics focuses on a combination of the individual and professional frames of reference, whereas macro-ethics combines the societal and professional frames of references. This is not to suggest that micro-ethical decisions made by engineers cannot lead to macro-ethical issues or solutions nor vice versa.

Micro-ethics has historically been prominent in engineering ethics case studies (which is a popular way of teaching ethics to engineers), but recent years have seen a marked a change towards a more concerted focus on macro-ethics in case-based pedagogy [4]. Rottmann & Reeve [5] argued for the import of bridging the micro/macro-ethics divide by more concertedly connecting equity and ethics. They identify that these two phenomena have historically inhabited distinct scholarly spaces in engineering ethics education. Rottmann & Reeve [5] called for the integration of a critical social justice perspective within and throughout engineering ethics. Such a perspective is, in part, defined by the generation of equitable outcomes such as "removing barriers to discrimination at the group level" (p. 151). As they write in the conclusion of their work:

> *Ethics and equity are not new content areas to be learned in class, nor are they human factor design constraints extraneous to the real engineering problem. They are integral to the personal and professional lives of engineers, connecting micro-ethical dilemmas with macro-ethical consequences from a range of social locations. Engineering educators, professional engineers and engineering students across institutional contexts must habitually infuse our everyday ethical decisions with equity considerations—considering at each step, how our own values, experiences and beliefs shape our actions and how these actions shape the social conditions of others. (p. 161)*

Engineering codes of ethics provide one source of professional guidance for engineers [2]. Historically, or at least initially, engineering codes of ethics focused on loyalty to one's company [6], whereas recent decades have seen a rise in focus on external stakeholders. Coupled with this shift has been the explicit integration of DEI and DEI-related sentiments into some engineering codes of ethics. For example, equity is explicit in the National Society of Professional Engineers' [7] code of ethics, whose preamble states that "the services provided by engineers require honesty, impartiality, fairness, and **equity**, and must be dedicated to the protection of the public health, safety, and welfare" (emphasis added) Likewise, the preamble in the American Society of Civil Engineers' [8] code of ethics states that members should "treat all persons with respect, dignity, and fairness in a manner that fosters **equitable participation** without regard to personal identity" (emphasis added).

While NSPE and ASCE's codes of ethics explicitly feature equity, other codes incorporate DEI-like considerations. For example, IEEE's [9] code of ethics includes the provision that IEEE members should "treat all persons fairly and with respect, and to not engage in discrimination based on characteristics such as race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression." While DEI is not explicit in IEEE's code, non-discrimination and fair treatment of all persons regardless of demographic diversity are key ideas that are central to many DEI initiatives.

While codes of ethics offered by professional societies are not always legally binding, they always provide a common understanding of what is expected from engineers [2]. As Matsuura [10] described, "The codes applied by professional organizations present aspirational goals intended to preserve the integrity of the engineering profession" and which can "provide a framework of conduct that can be used by engineers as justification for their decision-making and their actions" (p. 258). While codes offered by professional societies bear less legal weight than codes of conduct contained within state governments who license engineers, they can be leveraged as a "framework of evidence" to "support their professional decision-making and actions," including in legal contexts.

As both Matsuura [10] and Davis [2] describe, codes of ethics can inform how engineers ought to act ethically. Given the import of ethics in engineering practice, ABET [11] requires the teaching of ethics to engineers. In engineering ethics education, engineering codes of ethics are one of the most common instructional approaches in teaching engineering ethics [12, 13]; accordingly, when instructors integrate codes of ethics into their instruction, they must be prepared to discuss all facets of the code, including (but not limited to) why integrating equity, non-discrimination, and other aspects pertaining to diversity, equity, and inclusion (DEI) are important.

This work is especially timely given that DEI is under attack in many US states [14]. As a result, in many states, there is growing misalignment between engineering codes of ethics and state laws associated with DEI's incorporation into higher education. This work can provide guidance for engineers and academics to respond to, and potentially counteract, the rise of anti-DEI legislation that is incongruent and may sometimes conflict with codified values of professional engineers.

II. Research Methods

A. Research Questions

In this study, we addressed two research questions: (1) "To what extent and in what ways do participants view it to be important to incorporate DEI into an engineering ethics code?" and (2) "How do participants view the incorporation of DEI into the IEEE code of ethics?"

B. Theoretical Framework

Engineering education is still a relatively young discipline. Methodological norms in engineering education research have shifted between an emphasis on rigor to methodological diversity, thus balancing prescribed norms of rigor that were largely borrowed from traditional engineering methods vis-à-vis the value of diversity [15]. Some scholars have contested definitions of rigor for engineering education research that manifest as inflexible and exclusive of such diversity [16].

Scholars have offered validation frameworks specific to research in engineering education in light of such challenges regarding norms of research praxis [17]. As one example, Sochacka, Walther, and Pawley [18] specified the import of

ethical validation in engineering education research. Ethical validation as a concept is especially pertinent to this study, as it centers questions around DEI in the research process, such as: "Do the ways in which we construct and disseminate our findings respectfully and productively engage diverse audiences who have a stake in the social reality investigated?" (p. 375).

As the preceding quote highlights, and as we posit in this work, understanding and recognizing the import of the *social realities* that researchers explore (and doing so respectfully) are central considerations for ethical and valid research. Moreover, as the quote suggests, and as we agree, the research process is one of construction, which is a *social* process in that it involves multiple individuals (i.e., a team of researchers, participants), interpretations across individuals, all toward the development of new knowledge. This new knowledge is both limited but also valid in that it is an accurate, inclusive (i.e., collects data from diverse audiences), and respectful representation of both the researchers' and participants' experiences and understandings.

Ethical validation also prompts one to consider motivations and intentions for engaging in research [18]. For our team, this study is motivated by the extant contestations regarding whether and how DEI should be incorporated into engineering ethics canons. We build on prior works exclusively focusing on the integration of DEI within engineering, such as Rottman & Reeve [5] (featured in the introduction) and Riley & Lambrinidou [19] who questioned how social justice might be integrated into engineering codes of ethics in light of power dynamics that have historically existed within the profession. As Layton [6] describes, engineering codes of ethics build on a historical backdrop where loyalty to one's employer was a central concern. Thus, like this research study, which is informed (and constrained) by the research team and the participants' perspectives, extant codes within professional societies are informed (and constrained) by this historical backdrop.

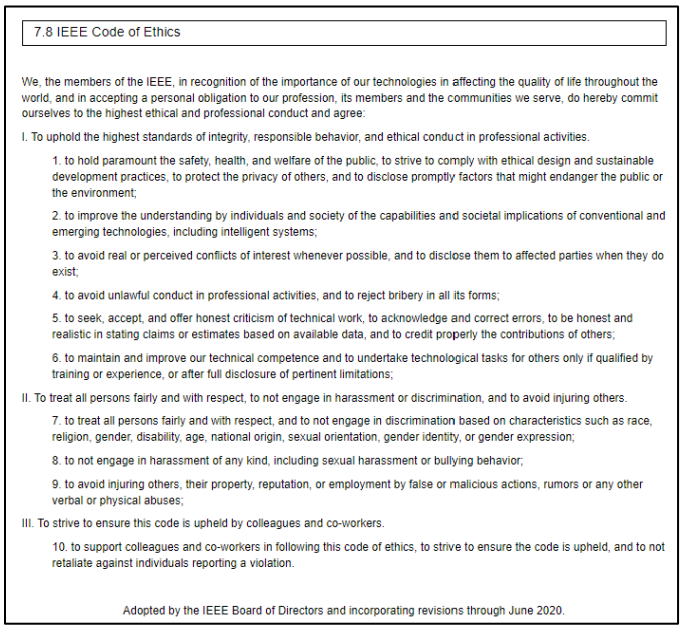
In short, we recognize both engineering education research and engineering codes of ethics as social constructions which, in the spirit of ethics, may warrant revisions to better "take care for the basic needs and legitimate expectations of others as well as our own" [1]. This study can support such revisions within professional societies by bolstering understandings of ethics/DEI intersections in codes based on the perspectives of two groups of stakeholders (academics and practitioners), each of whom brings expertise in ethics and/or DEI in engineering.

C. Data collection

1) Interview Protocol

In this study, we adapted Ford and Sterman's [20] expert elicitation study methods to create a semi-structured interview comprised of three parts: (1) Positioning, (2) Description, and (3) Summation [21]. Interviews were 90-120 minutes in duration. The Description interview portion included three activities and was the heart of the interview: (1) a drawing exercise where participants drew how they viewed engineering ethics and DEI to connect; (2) the ethical considerations associated with hiring and retention issues of minoritized groups; and (3) a depiction of the role and import of integrating DEI in engineering codes of ethics. A complete description of our interview protocol is described in Hess et al. [21].

Here, we analyzed a subset of interview questions contained in the third (i.e., final) part of the Description section. Generally, this section of the interview began about 75 to 90 minutes into the interview and lasted approximately 15 minutes. This section opened with the question, "How should DEI be incorporated into engineering ethics code, if at all?" Next, we provided participants with the IEEE Code of Ethics [9] and then provided participants with time to review the code (refer to Figure 1).



7.8 IEEE Code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

I. To uphold the highest standards of integrity, responsible behavior, and ethical conduct in professional activities.

1. to hold paramount the safety, health, and welfare of the public, to strive to comply with ethical design and sustainable development practices, to protect the privacy of others, and to disclose promptly factors that might endanger the public or the environment;

2. to improve the understanding by individuals and society of the capabilities and societal implications of conventional and emerging technologies, including intelligent systems;

3. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;

4. to avoid unlawful conduct in professional activities, and to reject bribery in all its forms;

5. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, to be honest and realistic in stating claims or estimates based on available data, and to credit properly the contributions of others;

6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;

II. To treat all persons fairly and with respect, to not engage in harassment or discrimination, and to avoid injuring others.

7. to treat all persons fairly and with respect, and to not engage in discrimination based on characteristics such as race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression;

8. to not engage in harassment of any kind, including sexual harassment or bullying behavior;

9. to avoid injuring others, their property, reputation, or employment by false or malicious actions, rumors or any other verbal or physical abuses;

III. To strive to ensure this code is upheld by colleagues and co-workers.

10. to support colleagues and co-workers in following this code of ethics, to strive to ensure the code is upheld, and to not retaliate against individuals reporting a violation.

Adopted by the IEEE Board of Directors and incorporating revisions through June 2020.

Fig. 1. IEEE's [9] Code of Ethics (Approved in 2020)

We next asked participants, "Do you think any of these considerations are inappropriate in an engineering ethics code? If so, which?" At the participants' discretion, they either discussed the code overall, at an individual clause level, or at the individual code level. We then asked participants to interrogate the code, including whether they felt the provisions included were appropriate for an engineering ethics code. Our goal was to continue discerning views regarding how DEI ought to be incorporated into ethics codes, not how it ought to be incorporated into IEEE's code of ethics. Readers will note that DEI is *not* explicit in IEEE's code of ethics, although DEI-related sentiments are pervasive, especially in Clause II.

To conclude this portion of the interview, we asked participants, "In the context of your own professional discipline, do you think that DEI should be emphasized within ethics codes? If yes, how exactly? If no, why not?"

2) Summary of Interviewers

Most interviews included a lead interviewer and a supporting interviewer. Author 1 (Hess) led interviews conducted with engineering practitioners, and was often joined by Author 2 (Panuganti) and Andrew Whitehead (a former project researcher assistant). Author 3 (Anakok) and Author 5 (Katz) led interviews with academic participants. Author 1 was a white male from the US who held degrees in civil engineering (MS/BS) and engineering education (PhD). Author 2 is an underrepresented female who held materials engineering degrees (MS/BS) and was pursuing a PhD in engineering

education. Author 3 is an underrepresented female with a mechanical engineering degree (MS/BS) and was pursuing a PhD in engineering education at the time of the interviews. Author 4 (Jesiek) is a white male from the US who held degrees in electrical engineering (BS) and STS (MS/PhD). Author 5 is a white male from the US who held degrees in chemical engineering (BS), environmental engineering (M.Engg), and engineering educatin (PhD). Finally, Andrew Whitehead was an underrepresented male with an electrical and computer engineering background and was pursuing a PhD in engineering education at the time of the interviews.

3) Summary of Participants

We interviewed 25 academics and 25 practitioners (refer to Table I). We targeted 25 interviews per group as this number is oft-cited as a target for data saturation [22].

TABLE I. PARTICIPANT DEMOGRAPHICS AND ETHICS/DEI EXPERTISE

Category	Item	# of Academics	# of Practitioners
Gender	Female	11	10
	Male	14	15
Race or Ethnicity	White/Caucasian	17	13
	Black/African American	5	3
	Asian	1	3
	American Indian/Alaska Native	1	-
	Multi-Racial	1	-
	Hispanic or Latino	-	4
	West Indian	-	1
	Prefer not to Answer	-	2

Our goal was to interview experts [20], or individuals who brought expertise in ethics, diversity, equity, or inclusion. We distributed a recruitment survey to participants or groups of individuals who had relevant expertise based on their research, teaching, service, or practice. In the recruitment survey, we asked participants to self-report their level of expertise based on the question, "What do you consider your level of expertise on the following topics (Ethics, Diversity, Equity, Inclusion, Other) in engineering or engineering education?" Practitioners tended to report slightly higher levels of ethics expertise than DEI expertise (refer to Table II).

TABLE II. PARTICIPANTS' SELF-REPORTED ETHICS & DEI EXPERTISE

Self-Reported Expertise	Mean for Academics	Mean for Practitioners
Ethics	2.16	2.28
Diversity (D)	2.40	1.84
Equity (E)	2.44	1.88
Inclusion (I)	2.36	1.92

Through the remainder of this paper, we utilize a common nomenclature to refer to participants where "A" refers to academics and "P" refers to practitioners and the following number refers to the sequential order of the interview relative to the group. For example, P20 represents our 20th interview with engineering practitioners.

D. Data Analysis

Our analysis in this paper solely builds on responses to questions in the third part of the Description section of the interview (Refer to Section II.C.1). We have (and continue to) separately analyze other aspects of the interview [21, 23, 24]. Thus, while we sought to approach data analysis for this study with a blank slate mentality, emergent findings from these separate strands of analysis have informed our thinking.

To address our first research question, we analyzed responses from both participant groups for the interview question, "How should DEI be incorporated into engineering ethics codes, if at all?" To address our second research question, we analyzed responses from the portion of the interview where participants reviewed and discussed the IEEE code of ethics.

We employed thematic analysis guided by Braun and Clark [25]. Authors 2 (Panuganti) and 3 (Anakok) led inductive coding for transcripts from practitioners and academic, respectively. Thus, Author 2 identified and coded practitioner transcripts, and Author 3 did the same for the transcripts from academics. These authors created a shared online spreadsheet and situated excerpts from each participant alongside emergent codes. Throughout this process, they shared initial codes with each other, reviewed transcript passages associated with codes, and provided peer feedback. This iterative process was repeated until no more codes emerged from the data.

The two coders shared their emergent codebooks (one for practitioners and one for academics) with the rest of the team (Authors 1, 4, and 5) during weekly team meetings, who provided feedback on emergent codes. Author 1, 2 and 3 integrated the feedback from the team. Authors 2 and 3 defined emergent themes associated with practitioners and academics, respectively. Finally, Author 1 facilitated a group dialogue to discern shared themes across practitioners and academics. The shared themes were then narrated with exemplary quotes from participants, critiqued by team members, and then finalized.

E. Limitations & Future Work

This study focused on the perspectives of engineering academics and engineering practitioners. We sampled participants with moderate to high-levels of expertise in engineering ethics and/or DEI. Some participants brought expertise in both areas. Had we chosen to only interview participants with expertise in both areas or participants who had expertise in neither area, our data may have yielded distinct results. Moreover, our participants primarily hail from the United States and are predominantly white. As individuals from diverse racial backgrounds may view the role of DEI in ethics differently, our results may not adequately represent perspectives from all racial and ethnic groups. Our data collection occurred between the summers of 2022 and 2023. If we were to collect data in today's US landscape, where political opposition is explicit and prominent in many US states and

universities of higher education, our results likely would have yielded distinct responses among participants. Even if we were to retain our focus on experts, such experts (especially experts in DEI) may have vastly distinct experiences and stories regarding DEI's valuation (or lack thereof) in their workplace. Future work may help enhance the generalizability of findings by interviewing participants in the contemporary political US landscape and focusing data collection efforts on certain demographic populations or levels of expertise.

III. Results

A. RQ1: Integrating DEI into Engineering Ethics Codes

Authors 2 and 3 initially generated five themes from practitioners and four themes from engineering academics, respectively. These themes highlighted varying perspectives and strategies regarding how DEI should be integrated into engineering ethics codes. While there was important variation across themes, we were able to discern direct alignment between four themes generated across both groups. Thus, we finalized a set of five themes, including the four common themes and the one additional theme developed based on practitioner responses.

1) Theme 1: The Ethical Import of Integrating DEI

Most participants, including individuals from the academic and practitioner groups, viewed it to be important to integrate DEI into engineering ethics codes. However, participants held varying views regarding how best to do so.

Many academic participants suggested that it was imperative to integrate DEI into ethics. They leveraged social justice to substantiate their claims, arguing that it was an ethical necessity to address historical and systemic inequities and injustices. When asked whether DEI should be integrated into engineering ethics codes, some participants referenced existing codes that already embed DEI or DEI principles. For example, A11 shared:

> *Well, it definitely should be, and I think that what I wish, and I do think the ACM [Association for Computing Machinery] code does this pretty well. You center it on justice and then you frame it as if you're committed to justice, then all of the stuff that falls under the heading of DEI is obviously something you need to do because that is part of justice.*

Engineering practitioners expressed a general sense of importance and positivity towards incorporating DEI into engineering ethics codes. While social justice was not explicitly named as their rationale, practitioners similarly drew attention to the social nature of ethical engineering. For example, P5 indicated that the goal of an ethics code is to "morally align engineers to a common cause" because "they affect society at large." Many engineers felt like the question was obvious and simply expressed a favorable view without going into detail. Thus, while we found that practitioners felt DEI was an integral and important part of ethics, unlike academics, many did not directly reference extant theories (e.g., social justice).

2) Theme 2: Explicit Inclusion

Academics were overall in favor of including DEI explicitly in policy, and they provided suggestions for policy changes or updates, including but not limited to changes to existing engineering codes of ethics. Most participants felt that such explicit policies would enhance equitable experiences both in the engineering profession and industry. As A1 shared, "It should definitely be incorporated into ethics codes to provide equitable experiences for engineers, or for the technologies that people interact with." Like A1, other participants emphasized that integrating DEI considerations into engineering processes would improve engineering products, including users' experiences with said products.

In addition to codes of ethics, academics expressed a need for integrating DEI concepts within engineering education and trainings. Participants emphasized that if DEI initiatives (including but not limited to those which may result from the integration of DEI in engineering ethics codes) were integrated at the educational level, future engineers would then be prepared to engineer with inclusive mindsets. As A20 articulated:

> *… if our profession is at the stage where we want to include it [DEI] within the educational component of the engineers, eventually we will include it within the professional component, which I assume is the code of ethics that they have to abide by.*

Practitioners who endorsed the implementation of DEI into ethics codes felt that its inclusion in codes should be explicit. P11 felt that DEI was not explicit enough in many current engineering ethics codes. They argued that "engineering ethics also includes embracing the principles of diversity, equity and inclusion." As a result, they supported making DEI explicit in engineering codes of ethics.

3) Theme 3: DEI Implementation Strategies

Participants who viewed DEI as important to integrate in engineering codes of ethics discussed overarching strategies to implement ethics and DEI in their academic or industry practices in light of such integration.

Academic participants suggested that DEI could be integrated directly into engineering design projects, including but not limited to the development phases of design. Participants specifically suggested the import of creating engineering designs with an inclusive mindset from the outset of the project; in so doing, engineering designers could minimize or prevent biases and forego exclusionary practices. This sentiment is captured by A7 who specified how ACM's code of ethics, which focuses on "databases," can support an engineer who aspires to make "sure that you don't program [a] database or your databases with bias to exclude groups of people."

Other academic participants identified some approaches to integrate DEI into engineering (and, we infer, engineering ethics codes) without explicitly using the terms diversity, equity, or inclusion. Thus, academics provided recommendations for subtly including DEI in engineering without overtly or explicitly naming it. For example, participants expressed using instructional methods that inherently promote inclusion but which they did not label as "DEI" focused. A8 used a metaphor to explain this approach:

> *So for instance, I would like my kids to eat vegetables. And I could just tell them that all [kids names] eat a plate of broccoli and they probably would not be too happy about that. […] If I just embed chopped up broccoli up and*

sprinkling in different parts of dishes, I don't even have to say the word broccoli, but there's already, so there's a way to incorporate that without explicitly calling [it] out.

Like academics, practitioners discussed the importance of designing effective strategies to ensure the actual and effective implementation of DEI. For example, P4 (who was familiar with the NSPE code of ethics) expressed the need to "assess" DEI sentiments expressed in engineering codes of ethics. As P4 shared, while an ethics code could tell people to treat others fairly, they were not aware of a way to ensure or evaluate the extent to which such treatment actually occurs. Thus, P4 agreed that it is crucial to integrate DEI in engineering ethics codes, but felt that such integration needs to be accompanied by practical strategies to realize the manifestation of said codes.

4) Theme 4: Challenges, Skepticism, & Uncertainty

While the previous themes highlight perspectives from participants who viewed it important to integrate DEI within engineering ethics codes, both academics and practitioners expressed challenges regarding DEI's integration in such codes.

Among academics, there were expressions of resistance or skepticism towards DEI's codification. Participants cited potential conflicts with existing practices or beliefs and resultant practical difficulties involved in implementing DEI initiatives within traditional engineering frameworks. Resistance and skepticism were often due to concerns about the practicality and relevance of DEI to engineering ethics, at least as it has been viewed historically. Other participants expressed high levels of uncertainty regarding how to teach DEI effectively in technical curriculum. As A9 shared:

Almost every single semester, I worry, I think students if I only talk about kind of complex, macro- ethical [questions], what should engineers' roles in society be? I think the engineering students can kind of come away and say, like, I don't know, "What you taught me, you didn't teach me anything tangible."

The difficulty of implementing DEI in "technical" engineering course contexts was a shared concern among many academics. Other academic participants described the contextual nature of DEI (thus seeming to suggest that ethics was less context-dependent). For example, A13 (who explicitly discussed codes of *conduct*) shared, "Here's the challenge. I think codes of conduct are useful when they can immediately translate to things that are forbidden or required. When it comes to DEI, things are so context sensitive."

Among practitioners, there was a heightened sense of uncertainty regarding whether DEI should be incorporated into ethics codes. For example, P7 felt that DEI initiatives could generate positive outcomes, but they also felt there was no right way to incorporate DEI into engineering codes of ethics. This uncertainty fueled skepticism, wherein the lack of a clear solution regarding how best to integrate DEI into engineering ethics codes made them unsure of whether it should be included at all. Based on responses to other questions throughout the interview (i.e., beyond the portion we analyzed for this study), we surmise that uncertainty regarding whether DEI should be integrated into engineering ethics codes correlated with some participants' uncertainty regarding what DEI initiatives look like or what DEI means.

Practitioners exhibited a sense of hesitation regarding whether including DEI in ethics codes was viable based on the variations of specific terminology that could or should be used and whether one could develop a code that comprehensively captured DEI. For example, P17 shared, "As soon as you start trying to list every different possible [form] of discrimination, you're going to have to amend it every two years, for a new one." By codifying all forms of discrimination, they feared that an ethics code would become too complicated or convoluted. They also feared that such a goal (i.e., a comprehensive representation of DEI) would require constant updating. Similarly, other practitioners expressed a fear that important DEI-related considerations may be omitted. Given the possibility of such omissions and the participants view regarding the unfolding nature of DEI, one participant suggested that ethics codes aspiring to integrate DEI would require updating for all new "flavors of the day."

5) Theme 5: DEI as Supererogatory

While the prior theme captures uncertainty and skepticism exhibited by participants, some practitioners were apathetic or even opposed to DEI's integration in engineering ethics codes.

First, some participants expressed what we would call apathy. For example, P13 suggested that it would not be a "deal breaker" if DEI were not incorporated into engineering ethics codes. They also speculated that the integration of DEI in engineering ethics codes may not be received positively by others in their politically conservative state.

Second, two practitioners felt that DEI was an important concept but suggested that it should *not* be incorporated into engineering ethics codes. P16 felt that there could be added and supererogatory legal expectations resulting from incorporating DEI into one's professional code. They questioned whether it made sense for professional engineers to potentially lose their license by not abiding by DEI principles. P20 similarly questioned whether integrating DEI into ethics codes would require legal actions and, in turn, whether such legal requirements may lead to downstream unintended negative effects. Importantly, both of these practitioners did not think that DEI was unimportant in engineering ethics, but that it was not the most critical factor for making professional ethical decisions.

B. RQ2: DEI in IEEE's Code of Ethics

After reviewing participants' general perceptions of whether DEI ought to be integrated into engineering ethics codes, we analyzed participants' views regarding DEI's integration within the IEEE code of ethics (refer to Figure I). While we originally intended to offer more granular level themes (like in the preceding section), we instead generated two major themes across both groups of participants reflecting positive and formative feedback; accordingly, we entitled these themes as (1) Positive Reception and (2) Points of Critique.

1) Theme 1: Positive Reception

Most participants expressed positive views regarding IEEE's integration of DEI-related sentiments into their ethics code (refer to Figure I). For example, P14 stated:

This is saying [that] we're committed to being good people, and we're not going to do bad things. Give me the argument, the contrary argument today, I'd love to hear it. […] We're saying we're going to be good people. We're not going to do bad things. You want to argue that point? That's fine, but I'm not buying any of that. I think it is absolutely appropriate. To say this is how we will conduct ourselves, this is how we will act, how we will treat people, it's great.

This participant expressed the idea that the code was well written and they liked that IEEE worded it in a way that encompassed the idea of being a good person. Other participants particularly appreciated the language IEEE used to describe the treatment of the people. This was often shared in regards to the language which explicitly called for ethical engineers to treat people fairly, to not engage in harassment in any form, and to avoid acting in malicious ways. P12 regarded the explicit incorporation of "disability" as a particular strength, and felt that this dimension of diversity was often forgotten or neglected in engineering codes of ethics. Overall, participants agreed that ethical engineers should act in respectful and non-discriminatory ways, and that codifying these actions was appropriate.

2) Theme 2: Points of Critique

While there was a general sense of positivity regarding IEEE's integration of DEI, there were numerous forms of critique offered by participants. A common critique regarded the negative language embedded in the code. As P24 noted:

Parts two, and three, you should focus on what people should be doing, and not telling them what they shouldn't [do]. You can tell somebody not to do anything. But that doesn't necessarily achieve the high-level goals you set. If you have a goal, you should be doing things to work towards that goal. Not avoiding things, not specifically avoiding things that don't get you to that goal. It is not proactive.

P24 further noted that negative verbiage was prominent in Clauses II and III but absent in Clause I, where IEEE members were prompted to "uphold" high standards. Because DEI was portrayed in ways describing how one ought not to act, participants felt that aspirational DEI actions were missing.

Another critique expressed by participants was that DEI elements, which were largely represented in Clauses II and III, felt like an afterthought. For example, A24 stated, "What I don't like about this is it talks about these high standards in section one, and then in section two, it's like they [IEEE] threw it on."

While some participants suggested that how DEI was situated or featured within the code made it feel less integral to engineering ethics than sentiments in Clause I, other participants simply suggested that the wording could be improved to ensure greater impact. For example, P11 stated:

[Clause] number two is the one I had a the most problem with. The way it' s worded, this is saying stuff that's already in HR codes, right? This is one I'll sit there and say, really, this is a very well-intended, but the road to hell is, is paved with good intentions. This is just kind of repeating EEO statements, […] it does cause me some problems, lots of problems. And, and again, you know, so I'm not a big fan. […] I don't underestimate how hard it is to update and rewrite things. But [clause] number two, to me felt like, "Okay, we got to cover it now." But that's not, that doesn't hit the principles, because you didn't hear me at one time [during the interview] specifically refer to anything that's in number two, except in general, broader terms. You know, because if you adopted the principles that I was talking about, you wouldn't engage any of those behaviors.

Finally, multiple interviewees described that the code of ethics could be viewed as performative, thus *not* ensuring that DEI issues were effectively addressed. For example, A24 stated that they felt the section was filled with buzzwords and "danced" around the connection between DEI and its societal impact. They went on to discuss that, while treating people fairly based on race was listed in the code, the racial inequities in society that undergird privilege are a core issue; yet, such issues were absent. A21 similarly took issue with the wording of Clause II, recognizing equity requires attending to systemic inequities. As they stated, "There are certain people who should be treated differently, because they come from a background that is more deleterious or marginalized." Both of these participants not only hint at the performative nature of the DEI clause in the IEEE ethics code, but also highlight that the code lacks the crucial aspect of equity that should be included to make and ensure authentic changes within organizations.

IV. Discussion

Findings from this study demonstrated the broad support for DEI integration in engineering codes of ethics based on the perspectives of practicing engineers and academics who hold expertise in one or both of these spaces. While participants were supportive of the integration of DEI into engineering ethics codes, this support was tempered by practical challenges and an espoused need for the thoughtful and purposeful implementation of strategies in organizations. Such purposeful implementation would ensure that organizations capitalize on the reasons undergirding the need for DEI's integration in engineering ethics in the first place. To this end, participants expressed that the successful and effective incorporation of DEI in engineering ethics (including but not limited to codes of ethics) requires overcoming educational, practical, and systemic barriers.

While the integration of DEI within engineering codes of ethics was seen as ethically imperative among many participants, such positivity was not universal. While some participants stated that DEI principles should have a more concerted focus within engineering codes of ethics, others felt the IEEE language was sufficient, and yet others questioned whether DEI should be within an engineering ethics code at all. For participants who expressed negative views regarding the role of DEI in engineering ethics, we surmise that there are three key factors undergirding such negative responses.

First, the unfolding nature of DEI may be a source of confusion. In the US, diversity was the first term utilized broadly within organizations and this was shortly followed by the phrase "diversity and inclusion" or "D&I". Today, as evident in our interviews, D&I continues to be an oft-used framing within engineering organizations. As a result, equity often seems to be missing from engineering ethics [5]. Moreover, we utilized "DEI" in this work, but other acronyms have been popularized, such as DEIA (Access), DEIJ (Justice), and DEIB (Belonging).

Second, political opposition towards DEI may fuel disdain towards DEI. DEI continues to be under attack in many US states, with roles associated with DEI in many higher education universities being recently terminated [14]. For example, in order to comply with Senate Bill-17 (SB-17) in Texas, the University of Texas at Austin recently closed its Division of Campus and Community Engagement which supported DEI initiatives on their campus [26]. Some responses have involved renaming offices, but other legislators and universities have actively dismantled DEI efforts due to such legislation [26].

While there is political opposition to DEI in the US, there is also political support. For example, parts of the US federal government continue to value DEI initiatives, such as NSF who explicitly prizes Diversity as evident through their Broadening Participation Major Initiative. As NSF states, "A diverse and capable workforce is vital to maintaining the nation's standard of excellence in STEM: science, technology, engineering and mathematics." [27] Likewise, ABET has developed and integrated approaches to embedding DEI into program criteria and are piloting such efforts in 2023-2024 and 2024-2025 accreditation cycles across forty institutions [28].

Finally, among our participants, the relative novelty of DEI's integration into ethics codes seemed to inform skepticism regarding its necessity. Here, we revisit considerations we briefly highlighted in our theoretical framework and cautiously infer that the integration of DEI considerations in engineering codes of ethics seems to parallel challenges in engineering education research regarding what constitutes valid or rigorous engineering education scholarship [15, 16]. In engineering education research, such conceptions of validity were largely informed by and entrenched within values of the engineering profession, writ broadly. Likewise, arguments regarding what should be integrated within an engineering code of ethics often seem to reference prior codes of ethics [6], thus suggesting that what has come before (here in terms of codes of ethics) can serve as a primary heuristic regarding what ought to come next.

After we asked participants to share their conceptions regarding how DEI ought to be incorporated into engineering codes of ethics, we then asked them to critique IEEE's code of ethics which was last updated in 2020 (refer to Figure I). Many participants were not IEEE members; as a result, when we showed them the IEEE code, it was new for them. Nonetheless, participants responded in positive ways, and re-emphasized the appropriateness of embedding DEI principles into engineering ethics. With that said, many participants offered formative feedback to improve the code. For example, IEEE's code of ethics emphasizes non-discrimination and respect, but other areas to grow the codes' attention to DEI within engineering ethics codes (as mentioned by our participants) include fostering diverse and inclusive work environments and encouraging continuous learning about DEI issues.

Participants emphasized the need for aspirational actions within codes. Accordingly, participants felt that DEI additions within an ethics code should be accompanied by practical strategies to ensure or realize change. As participants described, if DEI is incorporated in performative manners, it may rather generate harms. Thus, as professional societies or organizations integrate DEI into their codes, they should further consider whether additions reflect their values, mission, strategic goals, and associated strategies to ensure that such additions translate to practice among members. Such action items would also ensure that participants understand DEI as integrated throughout an organization including its purpose, and how to act in ways as aligned with the aspirational DEI goals.

As DEI continues to be under attack in many academic settings, engineering organizations should be cognizant of the potential legal implications of incorporating DEI-like language in professional codes of engineering ethics. While codes of ethics developed by engineering societies are not always legally binding, they can empower engineers' ethical decision-making and could provide fodder for legal justification for one's decisions [10]. The interplay, potential contradiction, and ways to navigate engineering codes of ethics versus state-level legislation is an important area for future inquiry.

V. Conclusions

Integrating DEI into engineering ethics codes, exemplified by the IEEE's Ethics Code, represents a forward-thinking approach to ethical engineering practice. Such an approach can emphasize the role of engineers in creating inclusive technologies and solutions that respect and celebrate DEI, ensuring that the engineering field evolves to meet the needs of a changing world. We encourage others to develop aspirational codes with the emphasis on social good and while prioritizing principles associated diversity, equity, and inclusion. Incorporating DEI into ethics codes in subtle and practical ways, as described by participants, could be an avenue to keep DEI ideas at the forefront of engineering practices while adjusting to the changing political landscape regarding the use of DEI-like language. As participants indicated, such efforts can help ensure equitable treatment, access, and representation across all levels of the profession. We hope that this work will provide guidance for others who are interested in fostering and leading innovations at the nexus of ethics and DEI in engineering. Moreover, we hope this work will help professional societies discern novel approaches for incorporating DEI into engineering codes of ethics with confidence that that such refines are aligned with the perspectives, needs, and values of its constituents.

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