Inclusivity Meter: Tracing How it Worked and What Was Learned

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Introduction
Engineering education as a field continues to explore how to create more diverse, equitable and inclusive environments. In particular, the nation's continued polarization brings the issue to the forefront of society. In this research paper, we present the implementation of an inclusive intervention that "worked." We explore the different ways in which one might conceptualize what works and what does not work when evaluating different practices. We note that engineering education would benefit from a critical perspective when the need to change an approach is identified.

Here we present the narrative of an educator implementing a weekly reflection activity, the Inclusivity Meter (IM), that allows students in a senior capstone course to communicate how included they felt in their teams or in the overall class that week. Through the narrative, we highlight the conversations that happened as the educator reflected on the work in her classroom with the two other authors. The conversation themes highlighted include the motivation for trying this new activity, concerns throughout the quarter about student response rates, and two cases that surfaced issues of inclusion, prompting further discussion.

After recounting this narrative, we dive into a discussion on how the engineering education community might continue to discuss what works, particularly for understanding differences in evaluating what works with technical content versus what works for diversity, equity, and inclusion efforts. This paper adds to the conversation as the community continues to support initiatives to address issues of diversity and inclusion at different levels, from person-to-person interaction in the classroom to systemic level efforts and to evaluate the success of these initiatives.

Related Work

Witnessing experiences of exclusion. A growing body of scholarship helps us bear witness to the experiences of marginalized engineering students. In 2007, Foor et al. shared the story of Inez, a student who is "first generation college attending, economically disadvantaged, [and] multi-minority female [1]." More recent contributions have brought to the fore the experiences of black, male students [2], international students grappling with mental health issues [3], and students with disability [4] . Such accounts provide a foundation for understanding what needs to be addressed in order to move from exclusion to inclusion.

Approaches for promoting inclusion. In addition, a growing body of work offers potential actions or practices that can be pursued in order to work toward inclusion. For example, a recent blog post for the ASEE Commission on Diversity, Equity and Inclusion [5] summarizes some of their own work on the experiences of marginalized students and offers three kinds of actions that those in engineering can pursue to promote inclusion (rather than marginalization). The specific actions are shown in Figure 1.
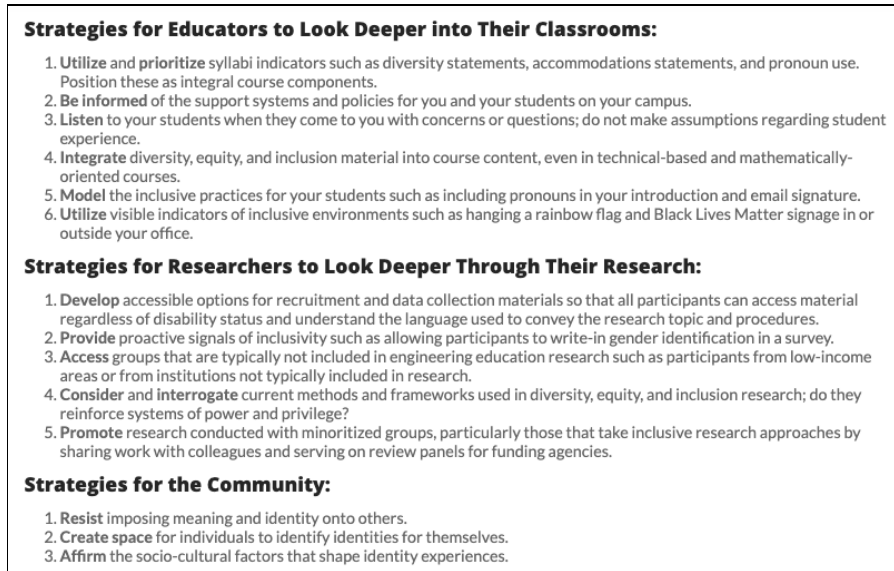
Figure 1. Strategies for addressing inclusion in engineering education [5]

Mejia [6] also provides a set of potential actions or practices that can be pursued. While her list is targeted exclusively at educators, the practices do include those that go beyond activity in the classroom. In comparison to the list provided by Secules and McCall, Mejia's list has a different origin in that it is the product of interviews with educators and the list is the set of actions that were mentioned by the educators in the interviews. For comprehensiveness, Mejia's set of practices is included in Figure 2 below.

These two collections are just some of the many possible actions, activities, strategies, and practices that could be leveraged by those in engineering education to advance inclusion. How might we understand what is offered? In Mejia's case, for example, the practices are those that individual educators spoke about because they have found the practices to be valuable. In Secules and McCall's case, the practices are being proposed based on their expertise and wisdom. In design terms, these practices represent the beginning of a solution to a "how might we" question in the form of "how might we promote inclusion in engineering education." Seen as the beginning of a design process, we can think about what is potentially not yet answered.

Designing vs. implementing approaches? If we see these ideas as the beginning of designing for inclusion in a classroom, what types of questions might we ask about such inclusive practices? If we are not simply implementing DEI practices, but designing these practices into our course, what might we question as we build on assumptions that the world is socially constructed and that the status quo is reproduced in many ways. Work in the area of design-based research offers a particular framework for thinking about these questions. In particular, Sandoval has proposed the conjecture map as a way to think systematically in order to connect the *embodiment* of an intervention through its *mediating processes* toward its *outcomes* [7]. Guided by these ideas from Sandoval, we could ask the following questions about any one of the ideas presented above.

- Outcomes: What could count as success or the intended *outcome*? Is it as straightforward as more inclusion of marginalized groups? What are variations in how we might articulate the outcomes? Are there additional outcomes?
- Mediating Processes: What do we know about the *mediating processes* by which success can come about? Are there intervening steps? Moreover, if an intervention is deployed over a period of time, what trajectory might be involved? How might the intervention change over time? How might the sense of important outcomes change over time?
- Embodiment: Perhaps even more basic is the question, what *embodiment* would a working intervention take? What constellation of artifacts are needed? What discursive events and practices need to be implemented? What specifically needs to be done to enact a particular idea locally?

ID	Practices In the Classroom (with students)	ID	Practices In the Classroom (by educators)
CS1	Create an interactive environment	CE1	De-center self
CS2	Create ways to have students connect to the material	CE2	Share social identities (i.e pronouns)
CS3	Re-arrange tables for group work	CE3	Minimize power dynamics to empower the space
CS4	Give multiple students an opportunity to talk	CE4	See students as people and invite them in as they are
CS5	Be intentional about how one calls on students to participate	CE5	Ensure content is accessible (i.e. provide transcripts)
CS6	Have holistic evaluation methods	CE6	Provide different forms of content (i.e audio, visual)
CS7	Allow time for reflection	CE7	Ensure the room is set to be accessible for all
CS8	Create student ownership	CE8	Solicit feedback (i.e. mid-semester reviews, exit cards)
CS9	Create a classroom community	CE9	Create content connection to society
CS10	Create opportunities to learn from other students	CE10	Know where the students are at (in learning, in life)
	Practices Outside the Classroom		**Integrity of Practice [4]**
OC1	Have one-on-one conversations with students	IP1	Acknowledge there is more than one way to teach and learn
OC2	Do outreach on campus or with K-12 students	IP2	Be aware that it is important to be intentional
OC3	Do Land acknowledgements	IP3	Acknowledge the educator's role in normalizing inclusivity
OC4	Do course preparation or revamping curriculum	IP4	Be flexible
OC5	Ensure building accessibility	IP5	Think about "How can I support you [the student]?"
OC6	Talk with other faculty as a site of inclusion	IP6	Respect your students
OC7	In grading, include meaningful comments	IP7	Trust your students
OC8	Think of inclusivity in the Admissions process	IP8	Realize things do not need to be taught by the instructor (i.e can be by students or video)
OC9	Display artifacts such as safe space stickers posted on the walls	IP9	Acknowledge diversity and inclusion is good for everyone not just marginalized groups
OC10	Advocate for other faculty to adopt inclusive practices	IP10	Understand that It is everyone's job to learn about diversity and inclusion

Figure 2. Practices for addressing inclusion in engineering education [6]

In formal DBR (design-based research) studies, the conjectured relationships are identified ahead of time and the research involves collecting data to see if the relationships happen in the hypothesized way. Before such formal DBR work, there needs to be a way to imagine and build the conjecture map. This work connects to understanding the mediating process of implementing an inclusive practice, not necessarily the outcomes.

This focus on asking critical questions is intended to illustrate a gap in the research on practices to support inclusion. We currently have few studies that focus on detailed accounts of the enactment of practices put in place to support inclusion goals. The current study is intended to address this gap in the research. Such research, in general, represents a way to move an approach from possible practice to evidence-based practice.

<u>"From does it work" to "What does it mean to work.</u>" In an educational theory paper, Gert Biesta examines key assumptions about evidence-based practices that might not be applicable to all learning situations. In Engineering Education, Donna Riley has connected Biesta's work to ABET evaluations and how epistemological differences affect how learning might be assessed [8], [9]. Biesta differentiates using evidence-based practice in education as a technical rather than a moral judgement or assessment of learning. He says professional judgements in education are ultimately value judgments [10]. These professional judgments that happen in practice are directly in tension with the technocratic approach from researchers who present findings as "what works" from a decontextualized perspective. In practice, educators have to ask what works for them, their students, their classroom, etc. This of course is often contradictory to the practice of technical research, which requires a positivist epistemology to arrive as close as possible to a generalizable truth, and sincerely ask "what works." In summary, Biesta aims to encourage education researchers and practitioners to be aware of which perspective they are viewing research from: a technical one, when solutions are considered as the best way of doing something and/or a cultural one, when solutions are evaluated within a specific context. Bringing these ideas alongside the ideas of design-based research presented above, we can interpret phrases such as the "best way of doing *something*" and evaluating solutions "within a specific context" as pointing to the need to interrogate *outcomes*. In other words, what does it mean for something to work. In the following section, we provide details on the specific context in which the Inclusivity Meter is used.

Context
The narrative of the Inclusivity Meter is specific to one classroom practice but is embedded in a larger department wide effort to become more inclusive. NSF Revolutionizing Engineering Departments (RED) program awarded the Mechanical Engineering department of Seattle University a grant in 2017. The goal of this five-year project is to build a culture that fosters students' engineering identities. Many changes have been made to the curriculum and courses throughout the curriculum so students could experience real-world engineering with practicing engineers. Engineering design courses for senior design projects provide students not only the opportunity to work with industry engineers on real-world design problems, but also the possibilities to learn the highest level of professionalism. In the past couple of years, notable changes in Engineering Design courses include using industry-like terminology and helping students take ownership of their project planning, as documented in previous work [11]–[13]. These changes aimed to simulate the practical working environment in industry. However, even with these changes, the department continued to see some students and faculty, specifically from underrepresented identities, in senior design teams experiencing discrimination. These recurring incidents called for more actions related to the awareness of diversity, equity, and inclusion issues, which could eventually lead to a more diverse and inclusive culture beyond the classroom, and into industry.

Beyond department wide initiative, there were a few conditions in place that created an appropriate environment for this relatively simple activity, the IM, to be implemented. The educator scaffolded conversation around inclusion in multiple ways. She was also aware of her limitations, as someone who was interested in promoting inclusion in her course, but did not have enough previous experience with creating inclusive spaces. From here on, we will refer to the educator as Dr. YH.

Scaffolding a DEI Intervention
In an effort to virtually build a community in Fall of 2020 that addressed issues in diversity, equity and inclusion, the Dr. YH took the following actions in an Engineering Design course:

1. Included a DEI statement in the syllabus. This statement was discussed in the first class session. This action was a part of a new department wide effort to include a DEI statement in the syllabi.
2. Agreed on the practice to all turn on the camera/microphone to say "Hello"/"Goodbye" to each other when we began/ended our meetings. This practice was to address issues related to meeting virtually on Zoom.
3. Each student team developed team norms and team contracts. Teams revisited their team norms constantly as the quarter went on. This was a new and intentional practice added to all engineering senior design programs to address team dynamic issues that occurred in the past.
4. Used Canvas Discussion board for various subjects including design thinking, engineering ethics, and implicit bias. Students constantly replied to other's posts and shared knowledge among themselves on the board. This was a common, but intentional practice.
5. Created a dedicated Microsoft TEAMS site for all senior design teams to communicate virtually. This was a common practice, but more important during the virtual quarter.
6. Met with each team throughout the quarter to identify any changes in team dynamics. The educator asked "how are you doing" each time.
7. Used the "Inclusivity Meter" to check in with students weekly, which provided an avenue for students to reflect and voice their concerns using an anonymous Microsoft FORMS survey.

Additionally, two practices to scaffold the inclusive environment developed while the quarter was already in session, in response to student feedback

8. Adopted MURAL (www. mural.co) to collect comments and questions during status check-in presentations. After each presentation, there was a two-minute "quiet time" for everyone to post their comments/questions on MURAL, and the presenting team could select a couple of questions to answer on the spot. Students felt they could voice their opinions more freely using MURAL and had received more in-depth feedback from their peers and faculty than without the use of MURAL
9. Hosted a virtual conference at the end of the fall quarter so students could present their achievements. All sponsor liaisons attended the virtual conference and were deeply engaged in discussions with student teams.

Again, for this paper, the focus is intervention number seven, the Inclusivity Meter, a weekly reflection activity with two questions: "How included did you feel?" and "Are there any additional comments you would like to add?" The reflection activity was not tied to grades in the course. Even though the Inclusivity Meter is the focus of this paper, these other practices come up throughout the narrative, pointing to the interconnected nature of scaffolding an inclusive experience.

Approach

This study uses narrative analysis to discover the patterns of conversation between the instructor and the other two authors. The researchers met bi-weekly to debrief on the implementation of the Inclusivity Meter. The instructor was asked to generally elaborate on the question "How is it going [with the inclusivity meter]?". Follow up questions were asked in order to have the educator clarify or expand on specific examples. Five of the six sessions were video and audio recorded. The research team took notes on the conversation in all six sessions. These multiple sources of data contributed to the team's effort to establish credibility of the data. Because this study focuses on the experience of the educator, the responses to the reflection activity have not been analyzed. Only the instructor had access to those responses. To analyze the 6 sessions, the research team looked for repeated topics of conversation in order to produce the narrative. The topic of "what works" surfaced from the narrative themes found in the interview notes and led to transferable results, which other educators can learn from and consider in their own situated context.

Positionality

In the spirit of Secules et. al [14], we document how the positionality of the researchers impact the work using the following categories: research topic, epistemology, ontology, methodology, relation to participants, and communication. The first and third authors are advisee and advisor respectively. Together, they explore topics of reflection and diversity, equity and inclusion and are primarily qualitative researchers with a background in engineering. They are in a Human Centered Design & Engineering department, where different ways of knowing are valued, and specifically, lived experiences are seen as rich sources of data. This positionality influenced our approach on centering the educator and her experience to understand more about the learning curve with implementing inclusive practices in engineering classrooms. With no formal training in DEI related work, the educator gained more knowledge about inclusion by engaging in deep discussions with the researchers. The educator herself felt this accumulation of knowledge helped to further her commitments to promoting inclusion.

Findings

Looking across the six sessions, a few topics became prevalent in the conversation. Here we present what was discussed thematically: Discussions Around the Educator's Motivation, Discussing the Inclusivity Meter, and Discussion of concurrent (in vivo) DEI Issues. The first theme was related to issues of *motivation* that surfaced for the educator as she sought to make sense of how her new practice was contributing to, or not, to the inclusiveness of her classroom environment. The second were *conversations* that explicitly mentioned the Inclusivity Meter activity. And the last were detailed descriptions of situations related to inclusivity that arose

tangential to the conversations around the Inclusivity Meter. In the discussion we connect these conversations to the question around figuring out if the practice worked.

Discussions Around the Educator's Motivation
The educators's motivation and questions about her motivation were documented throughout the six sessions. The first session detailed how the idea of the Inclusivity Meter had come about and why she decided to try it out. She had been in a department meeting discussing their RED Grant, when one of the authors, an advisor on the project, commented on how some students said they felt excluded from their team meetings and their voice was not heard after a discussion around students' senior design experiences. The advising author suggested trying a short survey every week that just asked if each student felt included in their meetings. Dr. YH liked the idea and thought it was a tangible and easy enough way to incorporate an inclusive practice into her classroom. She had previously seen the effects of exclusionary actions in her classrooms, both among students and directed towards her and was eager to do something to address the issue in the upcoming quarter. Dr. YH had personally heard about student experience in senior design of feeling as if they were not being treated fairly, not feeling included, or not having their voice heard. Some students even felt discriminated against. She wanted to go beyond having statements or rules in the student handbook because having these rules had not done much in the past. "How do we make it stick? How can we make engineers aware of building a more inclusive environment for themselves and others, and consider that we are all a part of this? [How can we ensure the students] carry [inclusivity] with them to their workplace when they graduate?," she pondered. She recalled that one year, these rules were not enough because some students had still felt discriminated against, therefore she wanted to do more. And despite the strong motivation to do something about it, in the same session she discussed her own reservations. "I am concerned about not being qualified to host this type of activity. What if I see something and need to respond right away?" She continued, " I still feel like there is so much to learn and don't want to mess it up because it is so important." I "have the anxiety but still do it [practice inclusion], anxiety from poking into people's minds." Beyond conversations around her own motivation to implement the IM, conversations around the effects of the IM were also common.

Discussing the Inclusivity Meter
There were two main ways the IM appeared in discussion. One was when changes were made to the activity. The second was around the students' response rate. There were several changes made to the IM throughout the quarter, each with a specific reason behind it. Each discussion of change was either preceded by or followed by questions by the educator around what could be some reasons students were not all responding. This concern is consistent with Dr. YH's commitment to making sure this DEI practice was helpful in "making it stick." The changes included:

1. Responses to the IM were changed from being anonymous to the class, but not anonymous to the educator to being fully anonymous. During week 5, there was time set aside specifically for completing the IM questionnaire during the status check-in, where individual teams met with the instructor instead of spending time outside of class working on it. This change was continued during the weeks there was a status check-in scheduled for teams.

2. Finally, the last questionnaire focused on how included students felt throughout the quarter, not just for that week.
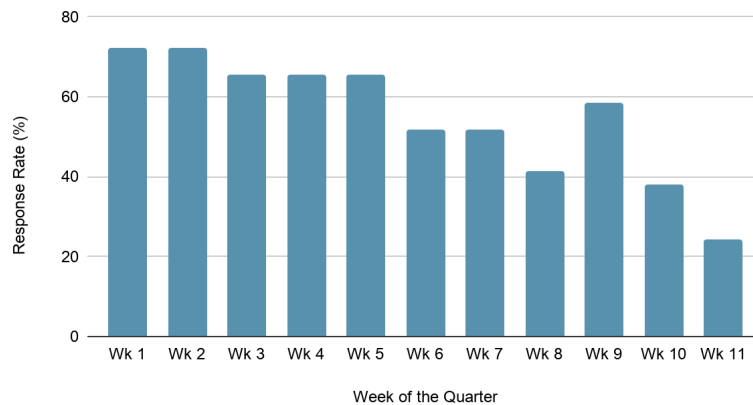

Figure 1: Response Rate to the Inclusivity Meter Over One Quarter. The response rates reflect a class size of 29 students.

From the educators perspective, a few main questions arose related to the response rate to the Inclusivity Meter. The first was related to how students perceived the activity. As shown in Figure 1, the response rate peaked at 75% the first week, and slowly declined to about a quarter of the class in the last week. Dr. YH thought she had stressed the importance of students filling out the IM, but she questioned whether or not students agreed with the importance of it. This led to questions around students who never engaged. It was difficult to know whether it was the same students not engaging or if those who did participate every week alternated, given that the IM was fully anonymous for most of the quarter. If it was the same students not participating, she wondered how to pull them in. She also wondered why those that did participate were motivated to do so. Did some students feel this was not important for this setting?

Related to these questions on response rate were conversations on the comments on the IM itself, which for the most part, were positive. The educator tried to make sense of what students were thinking by looking at the written response. There were comments around the team working well and about progress on technical parts of the project. Although the educator had heard about people dominating the conversation in some teams, these concerns were not reflected in the IM reflections. There were also a couple of comments for the IM and against it. One student suggested that the IM be used in other classes. But another student said that they understood the need to focus on team dynamics, but that they did not like to [focus on that] themselves. Instead, they would rather dive into technical content.

Other weeks she wondered how to quantify the work, how to incentivize students, given that it was optional. She mentions there were some weeks when there were a lot of exams going on, and externally, there was a lot going on with the pandemic and the 2020 presidential election. In session five, she realizes that the quarter is coming to an end, but that it does not signify the end of her work of trying to create more inclusive spaces in engineering classrooms.

Discussion of concurrent (in vivo) DEI Issues
The conversation around the IM with Dr. YH and the two other authors also led to other conversations about other diversity, equity, and inclusion issues that happened tangentially to the IM. The first case arose in Session 2. Dr. YH shared she had received an email from a capstone student. The workshop topic that week had been "Understanding Microaggressions" as applicable to their project teams. The email was two-fold. The student was suggesting that faculty and students in other classes should also have this workshop. The second part expressed the students' concern after a different faculty member had made a comment about this particular workshop, saying he had attended last year so he did not have to be there this time— giving the student the impression that the workshop was not that important. The student mentioned she was glad she went, despite the comment from her professor.

After receiving this email, Dr. YH felt conflicted "I don't know what to do. Any suggestions are appreciated," she shared with the research team, remembering a tense discussion she previously had with this particular faculty member related to diversity and inclusion. In session 3, the conversation continued. She had an update after having talked with the other faculty member. She felt the conversation went better than expected and both of them had come to the conclusion that one should constantly reflect and should be in conversations with other students and faculty around issues of inclusion. Nevertheless, finding the right way to approach her colleague and address her concern had been stressful. From this experience, she learned that it is important to continue the dialogue, even when one does not feel comfortable doing so. She felt that the department's discussion on the DEI statement had improved this professor's willingness to engage in such conversation. More importantly, as shown in this case, she felt the IM had made students more willing to share their thoughts on diversity and inclusion with her.

Another issue that came to light tangentially to the inclusivity meter was about a student who had not attended team meetings for about 3 weeks and had not been responding. His teammates expressed concerns about his well being. She discussed how to handle the situation with other faculty. Some thought they should take the "realistic" approach [and tell him he had to retake the class]. Putting herself in the shoes of an advisor, she thought she would want to find a way to help him. Especially since this was a three-quarter sequence course and having to redo this first one meant he would have to stay an extra year. Dr. YH considered how this should be addressed, given that every student has their own complex identity and set of experiences. The student, who was a nontraditional student, had been really honest about his absence once the educator got in contact with him and requested accommodations for him to make up his work. Dr. YH discussed possibilities with him and his teammates and helped the team move forward with their work. Situations like this had not been flagged in the IM, but deserved extra attention from the educator as a student-specific case of inclusion.

Overall, the educator expressed feeling fatigued about the general workload throughout the quarter. But she also felt a tighter bond with students even in the remote learning environment. She felt the IM had made students more willing to share their thoughts and feelings with her as shown in the two cases mentioned above. Now that we have presented the narrative of implementing the IM, we dive into understanding why naming what works is important.

Discussion

As the resulting narrative shows, our educator, Dr. YH decided to try a "small but a little risky" inclusive practice. The practice was incremental in that it did not take too much time to develop or implement and was relevant to the course content. Previous work shows that creating inclusive spaces is difficult because it requires an "authentic sense of value and belonging [15]." Dominant engineering culture often reproduces the idea that an engineering classroom is an objective space. The reality is that students and educators bring their own opinions, experiences, and cultures into engineering learning spaces, and these identities cause normal tensions to arise. Our narrative shows that this small, incremental practice created varied learning opportunities for the educators, students, and community, that were at times comfortable and at other times full of tension. As we continue to advocate for creating inclusive spaces, we discuss two ideas in response to dealing with the tensions that will arise when creating inclusive spaces: redefining our understanding of "what works" and finding our "integrity of practice."

What works? When? For who? For what purpose?
The first idea to discuss is changing our thinking around defining "what works." Dr. YH spent some time in all of the reflection sessions discussing the response rate, worried that the decreasing rate each week was an indication that the Inclusivity Meter was not working. In fact, a student comment in the IM specifically mentioned that since there had not been 100% participation in any week, they wondered whether they should still use the IM in class? In Biesta's paper, he differentiates between evaluating what works, as in what is effective, versus evaluating what works for what, meaning that defining what works includes questions about who is deciding what works, and what are they deciding it works for? In doing so, we examine different ways to measure whether a new inclusive practice is working or not. Biesta explains how education researchers and policy makers tend to favor a technocratic model to evaluate the effectiveness of educational means and techniques with the growing interest in evidence-based practice. By focusing on the technocratic model, education researchers, policymakers and practitioners forget that " 'effective' crucially depends on judgements about what is educationally desirable [10]." This leads to more questions such as what works for these students, what works in this context, what works in order to achieve these learning outcomes. By looking at the conversion the educator and research team had, we can see that we cannot answer the question, "did it work?" by looking at the student response rate or even by looking at student responses in the Inclusivity Meter, which tended to be positive. Instead, we ask different 'did it work?' questions. We ask, did it work to disrupt what conversations happen in engineering classrooms? Did it work as a signal to students that the educator wants to create inclusive environments and is committed to DEI efforts? Did it work as an effort to further the cause of revolutionizing an engineering department? In this paper, we answer these questions from the perspective of the educator.

Yes, the IM worked. Although Dr. YH has been an engineering faculty for more than a decade, this was the first time in her class she asked how her students felt on a weekly basis. As engineering faculty, we often focus on technical content in our classrooms and prefer quantifiable results. The tendency to evaluate success as such showed up when Dr. YH first implemented IM and her attention was mainly on the response rate. It was not until later when she realized how the IM helped her own growth in carrying out more challenging conversations with her colleagues and students. With the IM, she created a channel to engage with students in a

way that did not exist before, and she felt the connection to students' feelings she may not have gotten otherwise. The IM was only a simple exercise, but it helped Dr. YH face her own feelings of insecurity around DEI in engineering and opened her views to the breadth of the DEI work possible to introduce in her classroom.

Integrity of Practice: Rationalizing Decisions
In moving this idea forward, we explore what it means to develop an integrity of practice around inclusive teaching practices for educators. Similar to evaluating what worked, educators themselves need to build confidence in knowing that the inclusive practices they implement produce the learning environments and outcomes they intended. Young and Irving believe that an educator's Integrity of Practice enables the educator "to explain and justify decisions about teaching and learning activities to his or herself as well as to students, colleagues and institutional and other policy makers [16]." As the educator shared more about her experience with the Inclusivity Meter, she was able to articulate the reasons behind tensions she felt and the way she addressed them. This points to the need for self and community reflection as we continue to develop and understand inclusive practices. By incorporating the Inclusivity Meter into her classroom, Dr. YH was able to name the reasoning behind why she would continue using the inclusivity meter in following quarters of senior capstone. She would use it again because she believes it can spark more conversations about inclusivity among her students and colleagues and help her further reflect on her efforts in promoting DEI.

If we continue to evaluate inclusive practices as we evaluate the learning of technical content, such as the laws of thermodynamics, it will be difficult to gather quantitative data, because like leadership skills, skills around inclusion are social skills that need to be adapted to each context. In figuring out how we are defining what works, we are able to articulate our reasoning for having specific practices. Metrics such as the response rates and content of the IM reflection responses still informed the team about how the IM was going. In fact, we know that changes will have to be made to the IM in order to get closer to the learning goals desired, the changing culture, and growing awareness of DEI. But if we had just asked, does it work, these metrics would have led us to believe that it did not work, without a nuanced interpretation of the situation.

Limitations
The limitations we would like to highlight about this study include the fact that we only have the perspective of the educator. Of course, the findings are still relevant as an individual case study. Future research could be enriched by documenting the perspectives of students and even colleagues through interviews. Additionally, because the presence of the data collection impacted the actions of the educator, and in fact led to some of our key findings, we know this practice would have looked different without these reflective conversations. Part of the reason the IM worked was because Dr. YH was reflecting on her thoughts and actions and problem solving with the research team as she encountered tensions. These reflection sessions were intentional, but we acknowledge that the outcomes would have been different if we were only studying the IM meter and not the process from the educator's perspective.

Conclusion

In conclusion, this narrative study gives us an opportunity to see the process of implementing and incremental inclusive practices in an engineering classroom, the Inclusivity Meter. Our work contributes to populating a conjecture map in terms of connecting a design embodiment (the inclusivity meter) to the mediating processes (our detailed description of the impact over time) and finally the outcomes (our discussion of different ways in which the inclusivity is understood to have worked). Through discussions around this activity, we explore how the engineering education community can continue to have conversations about what inclusive practices work, especially more nuanced conversation around who they work for, what they work for, and in what context they work in. As Dr. YH discussed her practice with the research team, she was able to explain her reasoning for trying out the practice, the motivations behind it, and the tensions she encountered. The situated conversations allowed for the research team to discuss the many ways the IM worked for this specific context, and allowed for the educator to articulate how the IM met, or not, her learning objectives. This work encourages the engineering education community to find new ways to define how an inclusive practice is working for a specific context, as a supplement to a quantitative approach.

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