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Y(Our) story: A collaborative autoethnographic reflection of a faculty community of practice to promote equity-oriented engineering education

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Y(Our) Story:
A Collaborative Autoethnographic Reflection of a Faculty Community of Practice to Promote Equity-Oriented Engineering Education

Abstract

This **research paper** presents an autoethnographic study of a faculty-led *community of practice* assembled to promote reflection as a process to improve equity in engineering courses. The faculty participants (authors) committed to enact a variety of practices in self-reflection, reflection with colleagues, and reflection with students during one semester to build more equitable teaching and learning opportunities in their courses. This commitment came after participation in a series of DEI faculty development workshops in the previous semester and exploration of reflection practices during the formation of the community of practice.

The theoretical framework central to this work is Lave and Wenger's (1991) communities of practice that emphasizes members' coming together around a common interest to share experiences, to collaboratively improve their work, and to solve shared problems. Communities of practice are increasingly common as vehicles for faculty development, especially to promote high-quality, equitable instruction (Borboa-Peterson, Ozaki, & Kelsch, 2021; Hoyt, et al., 2020). As such, this paper examines the impact of a community of practice on reflective teaching to advance the authors' interest in expanding equity-oriented classroom teaching and learning opportunities for all faculty and students.

Rooted in autoethnographic methodology (Belbase, Luitel, & Taylor, 2008), the study explores individual narratives and their intersections with the stories of other community members to better understand the experiences of engineering faculty who use purposeful reflection to promote educational equity. The authors construct a shared narrative that grew from the interactions with fellow community of practice members and explore the culture of engineering education at their institution and the opportunities and challenges of advancing more equitable teaching and learning. Findings include prevalent themes of successes and limitations to supporting equitable classrooms, the impact of a reflection-driven community of practice on individual teaching performances, and the strengths and challenges of enacted reflection techniques for engineering educators.

Introduction

Efforts to promote equity in engineering education are rooted in the stories of those directly impacted, namely the faculty members who undertake this work and the students who are the intended beneficiaries. To consider equity-oriented engineering education apart from the narratives of those involved would be both incomplete and misguided. After all, the goal of any diversity, equity, and inclusion (DEI) initiative in the classroom should begin and end with people at the center of every goal and effort undertaken.

This paper examines the collective stories of six (6) engineering educators who came together in a NSF-sponsored *community of practice* [CoP] (Lave, 1991) to develop reflective teaching

practices as a means of advancing more equity-oriented engineering education efforts at their home institution, a large, Research I, midwestern university. Through collaborative autoethnography, the authors examined their preconceived notions and prior experiences with DEI efforts. They worked together to reflect on past, current, and future practices that would ultimately promote their shared goal of better, more inclusive classrooms for all students.

The authors offer a shared narrative, constructed from the stories they shared as members of the reflective teaching CoP, that illustrates the culture of their institution and both the potential and challenges associated with intentional equity-oriented practices as they enacted and reflected upon them. The collaborative autoethnographic account that follows confirms and challenges some of the findings from recent research on equity-oriented engineering education initiatives, and, most importantly, it offers consideration for future research and the continuation of direct instructional interventions that might improve the quality of engineering education as engineering educators aspire to more equitable learning experiences for all.

Relevant Literature

Not unlike other disciplines, engineering has struggled to define and to address issues that limit the recruitment and retention for and learning outcomes of students from diverse backgrounds (Cao, Murzi, & Chowdhury, 2023; Mejia & Martin, 2023). As such, engineering education scholars have regularly explored strategies for course development, instruction, and assessment that support more equitable learning experiences for all students (Walden,Trytten, & Shehab, 2018). To achieve this, scholars have focused considerable attention on faculty professional development to strengthen a commitment to DEI efforts and to equip faculty with practices and strategies that promote equity-oriented teaching (Bunin, Scott, Landoll, Servey, & Konopasky, 2023; Secules & Masta, 2020).

One successful approach to sustained faculty development to advance equity-oriented engineering education has been through the creation of DEI-focused CoPs (Castillo-Montoya, Bolitzer. & Sotto-Santiago, 2023; Sanford, Paige, Parker, & Valdes Vasquez, 2023). CoPs, in the spirit of Lave's theoretical design (1991), bring like-minded faculty together around a central goal or problem to address (Wenger-Trayner, E., & Wenger-Trayner, B., 2015). Through collectively identified norms and distributed leadership, members of these CoPs work together to learn and to grow as equity-oriented engineering educators. Central to the success of these efforts are routine gatherings, focused dialogue, deliberate action in the classroom, subsequent reflection, and consideration for future practice. CoPs readily support the development and growth of equity-oriented faculty members as participants work collaboratively to expand their teaching competencies through shared experiences and the co-construction, application of, and reflection on tools to advance their equity-minded teaching.

Whether through a community of practice or through another collaboration with colleagues, more faculty are turning to autoethnography as a way of understanding their personal and professional journeys toward becoming a more equity-oriented engineering educator. Autoethnographic research presents a unique opportunity for educators to consider their own stories as they identify needs, apply practices, and reflect on efforts to support all learners equitably in their classrooms and labs (Holly, 2020; Maxey, 2019). Extending beyond the value

of leveraging one's own story, many scholars are "teaming up" with fellow faculty members to craft collaborative autoethnographies that intertwine individual narratives to better understand the shared experience of faculty and students who are committed to improving the inclusivity of their courses and who recognize the benefits of learning from one another's stories to make sense of their experiences in the context of their own institutions and, hopefully, to warrant claims about successful strategies that can advance equity-oriented engineering education broadly (Cicek, Paul, Sheridan, & Kuley, 2020; Haverkamp, et al., 2019; Holly & Lee, 2024; Martin, Suresh, & Jensen, 2024).

Methodology

Collaborative autoethnography (CAE) is a qualitative research method that combines personal narratives with cultural analysis, enabling researchers to explore shared experiences within a specific context. This work follows the CAE research framework of data collection, analysis, and outcome writing presented in Chang et al. (2013). Prior to the CAE study, the research team was initially formed as part of a CoP supported by a National Science Foundation-funded center at their home university. The primary objective of the CoP was to foster and disseminate effective reflection practices in engineering classrooms, with an emphasis on equity-minded teaching. There are six instructors involved in this study. The demographics of each are provided in Table 1. The research team implemented the full collaboration model and had every member be involved in all aspects of the research process: data collection, data analysis, and publication writing.

Table 1. Research team member demographics.

Pronouns	Race	Department	Position	Years taught at current institution (total years teaching)	Type of courses taught
She/her	White	Bioengineering	Teaching Assistant Professor	5 (10)	Senior Design, technical elective
He/him	Asian	Aerospace Engineering	Teaching Assistant Professor	7 (9)	Undergraduate core courses
He/him	Asian	Bioengineering	Teaching Assistant Professor	2 (4)	Undergraduate core courses (All Levels)
He/him	White	Civil and Environmental Engineering	Assistant Professor	4 (5)	Undergraduate elective and lab courses
He/him	White	Educational Administration / Curriculum and Instruction	Director / Lecturer	15 (25)	Instructional methods / educational assessment

She/her	White	Bioengineering	Teaching Assistant Professor	4 (4)	Undergraduate labs and core courses

The research process began in the summer term, when the group met monthly to discuss the practices and values of self-reflection, reflection with colleagues, and reflection with students, with emphasis on how these practices support equity-oriented teaching and learning. When the fall semester began, the group decided to continue the reflection process through weekly meetings. Individual members were also encouraged to exercise their own reflective journaling. To provide structure and accountability for the journaling practice, reflection prompts were assigned on a regular basis. These journal entries became the data for the CAE. The authors chose CAE as the primary qualitative methodology over other approaches, such as interviews, focus groups, observations, or case studies, to highlight the significance of personal reflection about one's own practice related to equity-minded teaching and the intersection of personal narratives that occurred during the dialogues within the CoP.

Ten reflection prompts were included in the CAE (Table 2). Some prompts were completed during the weekly meetings, and others were done individually with shared deadlines. The concurring journaling practice during scheduled meetings was necessary to keep the team on track for data collection.

Table 2. Journal reflection prompts.

Number	Prompt Description
1	Tell us about how you think about equity and inclusion when you design or revise a course, ahead of its start.
2	What does equity in a classroom look like to you? Does equity ever come in competition with other learning goals for your students? How do you reconcile this?
3	How do you actively discover the diverse assets and needs of your students in an effort to support their learning? How do you use what you learn? What hesitancy do you have in asking students to share about themselves and in using what you learn to shape your instruction?
4	Tell about a time when you worried about being able to meet the needs of one of your students. Why were you unsure you could do it? What resources did you consider/use? What more would you have liked to have?
5	Share a story of a time when your specific/direct efforts to support diverse learners was successful. What made that effort successful? Is it sustainable?
6	Share a story about a time where you feel like you failed to support the needs of a specific learner or group of learners? How did you feel? What did you do when you became aware of this, assuming it was not intentional at the outset.
7	Share a time when your efforts to be more equitable seemed to backfire on your and/or on your students? What did you learn from that experience?
8	Is being equitable always fair?
9	Tell about a time when you worked with a colleague to support your goals of being a more equitable engineering educator. What were the benefits and the challenges of collaborating in this space?

10	Despite the attention paid to diversity and equity in official program messages, to what extent do you feel support from your department/college to improve your teaching and the learning experiences of all students?

To explore the culture and challenges of equity-minded teaching in the engineering curricula, the analysis of the journal entries was limited to the contributions from the five engineering faculty research members only. Each journal entry was first anonymized upon submission to the central repository and then inductively coded (1) originally by individual CoP members and then (2) reviewed, refined, and re-coded collaboratively during a CoP meeting. As codes were identified from the entries from one of the journal prompts, they were considered for applicability in other journal responses. The resulting codes were then grouped into major themes related to equity-minded teaching in engineering: equity through communication, equity through instruction, and equity through collaboration.

Each theme represents a different aspect of being an engineering course instructor that the research team members saw as both opportunities and challenges for incorporating equity-minded practices. For equity through communication, the team shared common experiences of success in explicit equity-based communication with students but also struggled to provide feedback and have concrete follow-up action steps for student concerns. Regarding course structure, team members all made conscious decisions to make course content accessible through a wide range of instruction modes, but balancing fairness and accommodations has been a major challenge. In the greater faculty community, the team wrestled with various levels of acknowledgement and support for equity-minded teaching from colleagues, the department, and the college, all of which have a significant impact on individual motivation and efforts for collaboration. In the following section, each theme will be explored in more detail.

Limitations

As a group, the authors aim to recognize the potential limitations of our chosen methods. Communities of Practice (CoP) in engineering education offer valuable opportunities for collaboration and knowledge sharing. However, CoPs are not without limitations that should be carefully monitored. One potential challenge is an imbalance of participation, both within the group and as a result of who received information about and volunteered to be part of the CoP. Time constraints further hinder engagement, as educators manage teaching, research, and service obligations. Sustaining a CoP can be a challenge, especially without institutional support or incentives. Institutional support, like we received from the funded Developing Equity-Minded Engineering Practitioners (DEEP) Center provided protected time from CoP participation. Measuring the impact of best practices for equitable teaching developed during the CoP can be another challenge. Benefits like improved teaching methods and professional growth can be difficult to quantify, especially on short timescales. However, reflective journaling during the autoethnographic process served as a means to document changing attitudes and evolving practice. Overcoming these challenges of CoPs requires intentional strategies such as fostering inclusivity within and outside of the group, securing institutional backing, and implementing mechanisms to measure and sustain impact.

Collaborative autoethnography (CAE), our research method, offers rich, in-depth insights by combining personal narratives with collective reflection. CAE does have limitations that should be accounted for during use. One challenge is its potential for subjectivity and researcher bias,

which can limit the generalizability of findings. Power dynamics within the group, influencing whose voices are represented, need to be routinely checked during discussions. This requires trust and openness among the group established before engaging in CAE. The CAE process is also time-consuming, requiring deep self-reflection, group discussions, and iterative writing, particularly challenging for teaching-focused faculty. This is where institutional support, like we received from the DEEP Center, is crucial for successful CAE methods. Furthermore, while CAE provides valuable insights, its findings are often specific to the participants and may not be broadly applicable, hence our transparency about the characteristics of our group (Table 1). Overcoming these challenges requires careful planning, open communication, and ethical consideration throughout the research process enabled by high levels of psychological safety and trust among the group.

Results

Equity through communication

Equity-minded teaching involves creating environments in which students can access content in a manner that does not exclude anyone. Gaining information from the students in the manner that they process information or other aspects that could reduce their accessibility of the information is important to creating and sculpting these learning environments. There are many examples of the use of surveys to gather this information during or before the semester to course-correct or design the lessons for the students (Giacobbi, 2002, Gummer, 2022, Tucker 2013,). Here we discuss how our findings relate to our reflections on how communicating with students might have helped create more equity-minded courses and how this could be improved.

Findings

A major theme that emerged from the journal prompt responses was the concern about being able to faithfully collect information about different students' diverse learning needs and create equitable environments whereby students can learn. Many of the sub-themes related to communication focus on deriving information and acting upon it without going too far in correction. These sub-themes included: (1) Surveying students before or during courses to identify learner differences, (2) Risks of stereotyping and assumptions about student needs, and (3) Specific versus universal solutions based on students' communicated needs.

Multiple team members' journal entries recounted efforts to incorporate information from student surveys and polled data at the beginning of the course, which helped them design and personalize their courses. Some instructors noted concern for "boundaries" on such survey questions to prevent students being asked to share too much personal information (which may lead to instructor bias or judgment if not done thoughtfully).

In contrast, another team member who also utilized pre-course surveys noted their intention to gather as much information as possible:

> *"I noticed many students' comments on anxiety or having mental health concerns, [which] influenced me to be more understanding. […] I didn't change assignments or my technical plan but changed how I interacted with the students."*

"Personal background information that I would ask my students include[s]: racial/ethnicity, gender identification, and sibling order. I typically don't feel any hesitancy in asking students to share about themselves."

Yet another member reported that while they have used surveys to assess different relevant information, the results have not been leveraged into identifying systemic learning inequities yet. The amount and variety of information gathered from students is challenging to synthesize into actionable steps one can take to meet the varied needs reported by students through the survey process:

"[A] faculty development program […] advised us to use early surveys to [assess…] how confident [students] are with the material and if there are methods […] to reach them. However, I do not use it as much as I could to address problems with systemic learning and inequities. There are much more rigorous questions to ask about belonging or learning preferences or even limitations that could exist within the student populations. I teach many groups of students who have already seen me many times during their tenure, so hopefully they are not intimidated or worried about offending or oversharing with me."

Collecting information through surveys alone could cause overgeneralizations resulting in stereotyping students and their needs; many instructors noted that other engagement with students directly offers a better opportunity to learn what students need to feel supported in the classroom. A few examples that represented this theme included:

"Most of my discovery comes from informal discussions with students or through conversations with teaching assistants. […When] teaching a small course, this is easier. […] Generally, I am hesitant because I feel that students may not be comfortable sharing, or may develop a feeling of stereotype threat if I ask too much on these types of questions. I therefore end up more often leaving it up to students when and how much to share."

"I am very cautious of unintentionally tokenizing students or introducing stereotype threat in the classroom. Therefore, I sometimes have avoided certain efforts at the individual level."

Others members mentioned a boundary of privacy that they do not feel comfortable crossing, even if the goal is clearer communication. It would be preferable to have the student traverse that boundary themselves rather than be prompted to do so.

"The term "learner variability" refers to how students are unique and varied when it comes to ways they interact with content. This can be impacted by delivery method and teaching practices, as well as barriers that learners may encounter, [including] second/native language, access, background experience or knowledge in the topic, disability, executive functioning, stressors, etc. In my surveys, I usually ask students if there's anything I need to know about them, leaving the door open for communication. However, I hesitate to ask specifics. […] Yet at the same time, they may not feel comfortable sharing if not asked directly."

Many of these findings echo other literature mentioning the use of surveys as tools to communicate with learners to find out information to better create accessible learning environments. Survey design is not a particularly new concept, and many literature sources liken it very explicitly to course design in that its objective is similar to the learning objectives, while the different goals of the survey mimic the goal of a course in design. As such, defining the goal of the survey will help guide the metrics on which it can be assessed. Hill et al. goes into depth about how best to phrase and organize these questions, advising they are positively worded, have specific responses with an appropriate number of options, and making sure the questions are organized in a thoughtful manner (Hill et al. 2022).

In addition to surveys, some argue that the places in which surveys shine most are in "collecting data on non-observable human phenomena (Hill, et al., 2022, p. 2)," and that assessing data from other factors in a more quantitative manner could be more instructive in aspects that are more observable or may show clear differences. For instance, this means assessing the merit or the benefit of a difference in instructional method in a quantitative manner rather than a survey asking opinions on its helpfulness. As such, these tools should allow students to share as much as is comfortable, while still being a useful method of finding what that can help them learn.

While gathering survey data in a positive manner was deemed important by many team members to design more equitable course design, implementing this information about students' learning variations was a separate difficulty, as team members had differing opinions on how to change the course design because of these communications. In one scenario, a team member tried to be more equitable by granting smaller, more clear check points in grading, to grant partial credit to those who completed the question correctly, despite a small error. This ended up being an overcorrection that backfired as it made the points less accessible than before, as students then scored lower when their solutions did not follow the "ideal" steps:

> *"[I unintentionally] penalized students [when] I tried to codify a "partial credit rubric" [to earn points...] Instead of increasing their scores, [I] did not take into account the distribution of what the students actually answered. […] I've since looked at all the answers first to identify the mistakes and where I can grant partial credit before I try to create [my own solution]."*

In another scenario, a team member recounted an experience with not considering a learner's variation when teaching a course that they had developed from scratch for the first time. They included open-ended questions that required students to make conjectures or educated guesses without all the necessary information, thereby identifying missing parts before finding or creating engineering solutions. One female international student struggled with these questions; the instructor first believed it to be a language barrier, but other communication and participation in the course was not a problem, and the student succeeded with knowledge-based questions. After encouraging the student to take a guess, the student began to thrive:

> *"The moment I moved to supposition or theoretical questions, she stopped making guesses. [However, when I encouraged her], over the span of a month, she overcame that restriction. […] Because of how she had been taught, [she believed that] if you don't know, don't say anything rather than making a mistake. […] The paradigm shift was enough to realize that there was no point in not taking chances. […] I have tried to be*

> *more attentive about the way that students respond to certain activities and […] the fact that different cultural interpretations and expectations to certain requests […] may just be as much a failure of design than a failure of knowledge retention. Being aware of the breakdown in communication is paramount."*

Additionally, another team member demonstrated the idea that student engagement is a crucial aspect of equity minded practice, while also admitting its challenges:

> *"In being fair to the whole class, the instructor must consider the needs of all learners while also ensuring nobody gets left out. In large classes, this can feel impossible. Providing resources and extra time to those who need it can be challenging based on individual circumstances. I try to use different teaching/learning styles, including different methods of assessment, active learning in class, and making content available online in the form of lecture videos."*

Equity through instruction

In recent years, investment in equity-centered engineering curricula and instructional development has rapidly been adopted at the institutional level (Abrams et al., 2021; Wood et al., 2024; Golecki & Bradley, 2024; Miller et al. 2022). These large-scale efforts have facilitated the creation of teaching tools and modules, new courses, and collaborative communities through faculty support. This research is a direct result of a college-level center supporting CoPs designed to promote the wider adoption of new and existing equity-minded teaching techniques. The following section describes key findings through CAE of the group as members reflected on equity-minded teaching in their own classrooms.

Findings

Another major theme that emerged from thematic analysis of CoP members' journal responses was opportunities and challenges related to ***equitable instruction***. Opportunities included: (1) Creating accommodations and modifications to course policies, (2) Multimodal instruction, (3) Diverse representation in course materials, (4) Active learning, and (5) Flexibility. Challenges included: (1) Being responsive vs. proactive, (2) Creating a dependable course structure vs. adapting to student needs, and (3) Lack of student feedback/feeling like flexibility backfires. Each is discussed below.

Responses revealed that team members made a conscious effort to incorporate equity-minded teaching in their classrooms from the start of a class. Examples include:

> *"I use surveys at the beginning of the course to poll students about their academic and personal background"*

> *"I try very hard to have all assignments on the Canvas page before the semester starts with all information needed to complete the course ready to go. I think this allows students to plan ahead and be aware of what is coming, so that if things come up, they can be prepared or at least feel like they know what is going on in my class."*

Specific instructional tools include accommodations outlined in the course policy, course structure elements, teaching modes, and accessible course design. These approaches to creating

an inclusive learning environment were not always targeted. For instance, one member provides a blanket assignment extension policy that all students can take advantage of regardless of the circumstances.

> *"I allow students to utilize a homework extension, missed quiz, and absence throughout the semester without penalty, no questions asked."*

Similarly, in an effort to not single out any particular student group, one member utilized multiple teaching modes to help students identify their own learning styles. These modes included:

> "*...short problem-solving in groups; think-pair-share; designing their own problems; trivia games during review sessions; no-stakes PollEverywhere assessments; using whiteboards; drawing an example of a concept in a biomedical context; using the projector-camera to show things in 3D; including videos from popular sources including YouTube or TikTok; asking students to volunteer to solve problems on my tablet; and relating to real-life examples.*"

There were also equity-minded efforts that focused on discussions centered around underrepresented and minority groups. For example, teaching modules to discuss ethics and implicit bias, doing literature reviews from authors of diverse backgrounds, and facilitating group reflection on stories of people from disadvantaged groups and how they encountered and overcame different engineering challenges.

> *"I have ethics modules in each of my courses so I try to review those modules and make sure I have up to date information about how engineering design impacts as many identity groups"*

While the team could identify specific efforts of equity-minded teaching in their classroom, many struggled to recall concrete examples of success stories that directly resulted from their work. One reason for the lack of success stories was that the CoP members did not have a system for students to provide feedback. One of the members expressed their concerns about not being organized enough to create a proper communication channel for students to reflect on the equity-minded instruction modes and elements. Another concern from the team was how to handle potentially emotionally charged discussions, where they felt ill-equipped to handle the situation in the engineering context. While handling emotionally sensitive topics, one of the research members was wary of unintentional tokenizing and stereotyping of people groups, which may lead to over or under-correction in classroom morale management.

> *"Generally, I am hesitant because I feel that students may not be comfortable sharing, or may develop a feeling of stereotype threat if I ask too much on these type of questions. I therefore end up more often leaving it up to students when and how much to share."*

A third major theme that emerged from the analysis was a discussion on specific solutions versus more universal attempts to be more equity-minded. The more generalized methods were intended to allow many different students with alternative methodologies to access the information, while the specific solutions were intended to prevent a specific group from being excluded. Both were valid methods to try to make the course more inclusive. Many team members recount success with equity-minded teaching in taking into account diverse populations of students.

In one example, a team member altered the course readings to be as inclusive of different racial, ethnic, gender, expertise, and field differences in the chosen journal articles, allowing the already diverse student body to see how experts in their field viewed the topics and started to solve them. The intention was to give students more instances of diversity while modeling for them what their futures could be in this field. This member stated:

> *"I [implemented class-wide] journal clubs in Surface Chemistry, [picking] authors that represented ethnic, racial, and gender minorities, viewpoints that were from different fields, and authors in various [career stages…] Diversity isn't simply a binary but a spectrum that is multidimensional. The feedback from the students was overwhelmingly positive and having those viewpoints made them feel [safer] in sharing their own opinions."*

Other team members adopted various active learning techniques that were intended to better increase student engagement for all and make the information about individual students potentially more accessible:

> *"I strive to include a variety of activities, hoping to reach all learners. [Introducing] active learning in this […] technical and lecture-based [course] helped many students to feel comfortable with the content. I integrated activities such as: short problem solving in groups; think-pair-share; trivia games; no-stakes PollEverywhere assessments; whiteboards to draw examples; a projector to demonstrate in 3D; videos from popular sources; and relating to real-life examples. But I also know that without changing the course structure, this can be [difficult]."*

> *"A guest expert in policy in transportation [spoke to] my graduate level infrastructure asset management course [...] about the importance of considering equity in transportation using real-life examples from her hometown. She had [students] reflect on stories of people from disadvantaged groups and how they encountered and overcame different transportation challenges. This was a tremendously successful activity and the students [rated] it as one of the best and most impactful lectures of the course."*

The concept that student engagement through active learning and other techniques was paramount to making sure that students felt invested and were able to access information in an equitable manner also related to aspects of equity:

> *"If equity is increasing the accessibility of a courses' material for the students, what engagement is to me is being able to draw out or have students invest themselves into the material."*

The perceptions and reflections of the team members indicate both reservations and self-doubt as well as optimism for improvement. Some noted that the fears that they have made an error which can "other" or belittle students can hamper the lines of communication due to the loss of social capital. This is a valuable point as instructors feel great responsibility to ensure that courses proceed as intended and they are as clear and as accessible as possible.

> *"[During a] lab activity, one student had a partner who focused on trying to [find] the solution online. Even after [I confronted] the partner, [they] continued to work alone*

while the other student did their best to copy the answer. Nearing the end of the class, the partner quickly finished the assignment, while the other student was left only with information that they did not quite know how to use. When this happened again the following week, I tried to help, but I was a bit impatient because it was the end of the class period. I was conflicted about my impatience; should I have stayed to make sure the student understood the learning objective of the sessions? […] Maybe I should have intervened [during] the first incident."

"I have a student who did not submit several assignments. […] Although I tried to discuss it with her after class [...], she always leaves very quickly [or was] talking to others, so I haven't found an opportunity since I was made aware of the issue. Now I will try to send an email to understand [the issue] and see if there is something I can do to help."

"It is humbling that my own experiences, privilege, or assumptions [can lead] to a less-than-ideal learning environment for my students. When I realize this, I try to correct it quickly with that student, but I worry that someone else was affected and I did not address it with them."

"[I have a] feeling of dread when I realize that I either misspoke or failed to speak up when I know I should have. Especially as the instructor I feel like it is my responsibility to speak up because of the social capital an instructor has. I think 10% of the time I have circled back to it (I wish it was more) and other times, [I] keep it in mind and try to avoid that situation again."

However, the overwhelming sentiment was that the setbacks were instructive and allowed for the team to improve and better the future implementations of those equity-minded techniques:

"I have had students write to me or […] tell me my efforts were noticed and appreciated. It […] inspires me to keep going even in the face of fear of failure or any apprehension."

Similar equity-minded teaching efforts from the research team were identified in other engineering institutions reported in literature. In-class activities aimed to improve student appreciation for diversity in engineering was one of the instruction reforms the team members found to be fruitful based on student feedback (Paguyo et al. 2015; Rambo-Hernandez et al. 2019). Practicing inclusive teamwork models was another effective instructional tool shared between the research team and published literature work (Brewe et al. 2010). The team's positive experience utilizing technical case-study-based instruction with socio-economic considerations is corroborated by Read-Daily et al. (2024) and Drzymalski (2023). The team observed that good intentions do not always translate to stories of success (Eastman et al. 2019). The lack of rigorous training and experience is a major contributor to the current state of diversity, equity, and inclusion integration into the engineering classroom. Still, survey work has been done where recommendations for future work have been identified (Walden et al. 2018). For our team, the need for consistent community/institution support and better instructional reform planning are two areas for creating sustainable reform. The team is motivated to continue meeting regularly as a community of practice to provide feedback to one another while collectively seeking external funding to solidify collaborative research direction as a team.

Equity through collaboration

While we found evidence that equity-minded teaching is happening among us and on our campus, our journaling brought forth the idea that while individual efforts are widespread, these efforts can be strengthened through collaboration with colleagues. However, collaboration is not without challenges.

Findings

A third major theme that emerged from thematic analysis of journal prompt responses was opportunities and challenges related to ***equity supported through faculty collaboration***. Subthemes identified by the group during analysis were divided into opportunities and challenges. Opportunities included: (1) Faculty collaboration on equitable teaching being an overall positive and helpful activity, (2) Faculty being eager for collaboration and collaborative opportunities. Challenges included: (1) Dialogue and sharing with peers takes time, (2) Different interpretations of support from colleagues or administration, (3) Funding motivation and capacity.

Responses revealed that team members appreciate opportunities to collaborate with peer faculty on equity oriented teaching topics. Faculty discussed opportunities created by the CoP:

> *"Being in a community of practice focused on equitable teaching has been tremendously helpful for me to learn new ideas, reaffirm my beliefs, and keep myself accountable to turn plans into actions."*

They also shared other opportunities they created among themselves:

> "*I do not know that we started with equity as a goal, but three colleagues and I formed a working group around the introductory course in our area of civil engineering, and we have had broad discussions about improving the quality of the course, which I believe in turn will improve recruitment and retention in our field among students from diverse backgrounds.*"

Members of the group also cited the potential benefits of an organized program to facilitate the discussions:

> *"Benefits are significant and programs (like this one we are in!) can be a huge support that would likely increase the amount of equity oriented practices happening."*

There is also a belief that faculty CoPs support individuals who are passionate about this work but feel new to this area:

> *"One of the benefits is the sense of comradery in the community, which made me feel optimistic about doing meaningful work in an area where I lack knowledge and experience."*

Challenges include individual buy-in:

> "Obviously, there are discrepancies from faculty to faculty on what they do and how much they do". And time allotted for these activities varies as well and can feel daunting given faculty workload, "so the assumption feels like we need to create those things on

our own, on top of every other expectation".

However members recognized that funding from government agencies for this type of work helps to emphasize the value to the college and university:

> *"At the college level, the NSF-funded DEEP center initiative has been helpful in getting me plugged into a community that is also interested in learning and growing in providing equity in the classrooms."*

Similar equity-minded collaborative efforts from the research team were identified in other institutions reported in literature. One of the first such efforts reported was by Ness et al. (2010), who developed a CoP to discuss issues related to social justice in teacher education. Costino (2018) documented the development of a CoP at a minority-serving institution and documented its practices extensively. Hakkola et al. (2021) formed a community of practice driven by the desire to develop more equitable practices, but found that their space allowed them to better critique systems of power and perceived inequities. The CoP model has also been employed successfully at the community college level to support making equity-minded institutional change (Sidman-Taveau & Hoffman, 2019). Some researchers who developed similar communities also used reflection as a tool to analyze their effectiveness and enact improvements (Kelley et al., 2020).

Implications

Through sharing our stories in individual journal entries and co-creating the collaborative autoethnography above, we have come to recognize the critical nature of well-devised and implemented plans for communication, instruction, and collaboration to promote an equity-oriented engineering classroom. Furthermore, we experienced the direct impact of a faculty community of practice as a highly effective strategy to advance our individual and collective understanding and execution of impactful inclusive teaching practices. Perhaps most importantly, we gained a sense of empowerment that only comes from realizing that, despite personal, professional, and institutional challenges, we can effect change in our individual classrooms as we learn about, from, and with each other.

Based on our study, we recommend the formation of CoP as an effective vehicle for motivating faculty to enact equitable teaching practices through reflections on their own teaching. The CoP should invest in the exploration of important themes that are unique to the group composition and use them to motivate faculty participation while sustaining the growth of the community. With the three major themes that emerged from our CAE, our CoP became more equipped to take practical action steps in our equity-minded teaching efforts. Namely, some members are pursuing a more structured feedback loop between students and instructors, where instructors will address the student equity concerns from surveys through modified instructional modes and then solicit further feedback in direct response to the modifications made. Such efforts will also provide interesting student perspectives on equity-minded engineering classrooms. The sense of camaraderie built through the CAE exercise also opened channels for supporting one another and collaborating on future projects addressing how to overcome the challenges that emerged with the major themes. For instance, the challenge to better address student needs from the equitable instruction theme inspired some of the CoP members to teach reflective learning practices to students through focus groups. Others are entertaining the idea of peer observation and evaluation protocols specifically addressing equitable teaching practices.

Moving forward, this research study invites the need to examine each of the three themes that emerged from the collaborative autoethnography in depth, especially considering the related sub-themes more closely in practice (Table 3). The engineering education community can benefit from research-based practices that link specific communication, instruction, and collaboration strategies directly to improvements in students' sense of belonging and their ability to learn. Equally important is the need to study the design and execution of future communities of practice to maximize their effectiveness as the vehicle for faculty to address equity issues in their classrooms.

Table 3. Major and sub-themes from reflective journaling

Major theme	Related Subthemes (Journal Prompt)
Equity through communication (miscommunication concerns)	● Belonging and Engagement (2) ● Pre-course surveys (3) ● Stereotyping risk (3) ● Communication/miscommunication (6) ● Specific versus Vague? (6) ● Overcorrecting (7) ● Assumptions about what students need (7)
Equity through instruction (overcorrecting/deficit mindedness)	● Accommodations and modifications (1) ● Responsive vs Proactive (1) ● Structure versus Adaptation (1) ● Multimodal (2) ● Representation (5) ● Active learning (5) ● Flexibility (7) ● Lack of student feedback/feeling like flexibility backfires (7)
Equity through collaboration (multiple perspectives, time, resources)	● Positive and helpful (9) ● Eager for collaboration/collaborative opportunities (9) ● Dialogue and sharing take time (9) ● Different interpretations of support, whether colleague versus departmental (10) ● Funding motivation/capacity (10)

In conclusion, engineering educators routinely recognize the importance of and the need for more equity-oriented learning experiences for their students. The message that faculty are not alone in this pursuit and that they can take direct action to make a difference has to be more clearly communicated through both word and action at our colleges and universities. Affording faculty members space, time, and structure for meaningful collaboration and problem-solving is an excellent first step in advancing equity in the engineering classroom. We all have stories to tell–successes and failures, informational and aspirational. What we need most is a community that values these stories and that is committed to helping us all to make positive changes together.

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