

Impact of Community of Practice on the Integration of Diversity, Equity, and Inclusion in Faculty-Student Engagements and Pedagogical Approaches

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Abstract

Universities are increasingly utilizing Communities of Practice (CoPs) as strategic instruments for knowledge management and professional development. The CoP provided a collaborative platform for teachers to exchange experiences, address challenges, and develop strategies that foster environments and spaces that respect and support all learners to fully and independently engage and contribute. Few research studies exist on the subject of using CoP to integrate diversity, equity, and inclusion (DEI) principles into Faculty-Students courses and curricula. This study therefore examines the effectiveness of CoP in considering a broad range of perspectives, experiences and backgrounds in Faculty-Students engagement in their pedagogical approaches. This study was carried out in a Historically Black College and University (HBCU) in the summer of 2024. Videos of faculty-engagement with students were analyzed before and after the CoP training. The CoP focused on creating a comprehensively inclusive learning environment, approaches to inclusive teaching as well as the execution and continuous maintenance of inclusive practices in Faculty-students engagement. The impact of the CoP on a DEI-centered approach in Faculty-student engagement was assessed using a validated DEI assessment tool, which focuses on changes in classroom content, and the integration of inclusive practices. All results were analyzed using qualitative contents evaluation of classroom observations supported by descriptive statistics and chi-square comparisons at 0.05 level of significance. Results from the study revealed there were significantly increasing integration of DEI principles in faculty-students engagement after CoP participation. This suggests that CoPs are effective means of fostering DEI in faculty-students engagement. This study effectively contributes to the growing literature on CoPs and DEI in professional development and knowledge management in the higher education space, especially HBCUs.

Keywords: Community of practice, Diversity Equity and Inclusion, Historically Black College and Universities, Faculty-student engagement.

Introduction

The principles of diversity, equity, and inclusion (DEI) are increasingly acknowledged as essential to cultivating vibrant and equitable learning environments in higher education [1]. Although many universities have introduced policies and programs aimed at advancing DEI, the practical realization of these principles within classrooms largely depends on the capacity, confidence, and sustained commitment of academic staff [2]. Yet, numerous educators report insufficient support, resources, or shared pedagogical frameworks to meaningfully embed DEI in their teaching practices [3]. Faculty members often face complex challenges, including confronting implicit bias, facilitating inclusive dialogue, and designing assessments that promote fairness; when attempting to integrate DEI into their pedagogy [4].

Communities of Practice (CoPs) offer a promising mechanism to address these gaps. A CoP is a structured but adaptive forum through which individuals with common interests collaborate to develop shared expertise, exchange ideas, and collectively respond to challenges [5]. Within the context of faculty development, a DEI-oriented CoP provides sustained opportunities for dialogue, critical reflection, and co-creation of inclusive teaching strategies. Unlike isolated workshops or one-off training sessions, CoPs emphasize continuity, mutual learning, and the progressive refinement of practice [6]. Through this model, educators deepen their understanding of DEI while benefiting from peer insights and collective problem-solving.

The advantages of DEI-focused CoPs are well documented. They offer a supportive environment for exploring the difficulties associated with implementing DEI, sharing evidence-informed pedagogical practices, and enhancing teaching approaches through iterative feedback. Their cyclical process, wherein faculty test DEI strategies, reflect on outcomes, and refine their methods fosters continuous professional growth and improved student experiences.

Beyond individual development, CoPs have the potential to advance institutional transformation by amplifying faculty-led innovations and informing wider curricular and policy reforms [7]. Faculty who participate in CoPs often emerge as champions of inclusive practice, inspiring colleagues and advocating for DEI-aligned resources and institutional investment [8]. Such grassroots engagement complements top-down initiatives and helps ensure that DEI becomes an embedded institutional norm rather than a symbolic aspiration.

The establishment of CoPs dedicated to DEI represents a significant shift in how universities approach inclusive pedagogy [9]. By prioritizing collaboration, reflective practice, and shared accountability, CoPs equip educators to create classroom environments where all students feel valued, respected, and academically supported [10]. The influence of these communities extends beyond individual modules; they help shape institutional cultures capable of preparing graduates for an increasingly diverse and interconnected world. Evidence suggests that the collective expertise cultivated through CoPs can catalyze enduring change in both teaching practice and organizational structures.

The development of CoPs to strengthen faculty engagement with DEI is, however, a multifaceted undertaking. Incorporating workshops and immersive learning experiences within CoP activities can enable educators to better understand social identities and barriers to learning, thereby contributing to more inclusive classroom environments [11]. As collaborative platforms, CoPs promote the exchange of experiences, resources, and strategies that enhance equity-minded teaching [1, 12]. They offer structured yet flexible spaces for faculty to pursue professional development aligned with institutional equity agendas and to adopt more inclusive pedagogical practices [13].

Persistent challenges such as racial conflict and microaggressions within classrooms are frequently attributed to inadequate faculty preparation in inclusive pedagogy [2, 4]. Participation in CoPs increases the likelihood that educators will adopt teaching strategies that recognize diversity as an asset to learning. Faculty-student interaction remains a critical determinant of student success, particularly for historically marginalized groups [14, 15]. Engagement in equity-focused CoPs enables educators to interrogate structural inequities and advocate for social justice within their teaching [7, 15]. In doing so, CoPs promote the dissemination of knowledge and resources that support the implementation of equitable educational practices [16]. CoPs ultimately foster inclusive learning communities that better serve diverse student populations [17].

Despite their effectiveness, CoPs face challenges, including maintaining sustained engagement and navigating institutional constraints [8, 9]. Their success depends heavily on institutional support, recognition of faculty time commitments, and a culture that values ongoing professional learning. Against this backdrop, the present study examines the effectiveness of a DEI-focused CoP within a selected historically Black college and university (HBCU).

HBCUs occupy a critical position in American higher education. HBCUs in the United States are widely recognized for their strength in engineering, education, business, public health, and the environmental and social sciences. They are established to provide African Americans access to tertiary education at a time of legal and institutional segregation. HBCUs have long served as engines of social mobility, cultural affirmation, and intellectual leadership. They continue to drive equity and social justice, particularly in STEM fields, where they produce a disproportionately high number of Black engineers, scientists, and doctoral graduates. Their mission-oriented focus fosters environments that support identity development, resilience, and

innovation while contributing substantially to economic development, community engagement, and culturally relevant research.

Understanding the impact of CoPs on the integration of DEI within faculty–student engagement and pedagogical practices in the engineering school of a HBCU is therefore essential. Engineering educators are often deeply committed to disciplinary excellence and the intellectual challenges of their field, sometimes at the expense of sustained attention to DEI principles [18]. Moreover, many engineering educators lack forums in which they can openly share experiences or learn from colleagues about incorporating DEI into their teaching. Few studies have examined the role of CoPs in fostering continuous improvements in inclusive engineering pedagogy. Addressing this gap is vital for informing institutional investment in CoPs as a strategic avenue for advancing faculty development in DEI and achieving long-term institutional goals. Based on these identified gaps, the following research questions were developed to proffer solutions:

- i. What specific DEI-related challenges do engineering faculty identify prior to engaging in the CoP?
- ii. In what ways does the CoP foster changes in engineering faculty awareness, attitudes, and reflective practices concerning DEI in engineering education?
- iii. To what extent does participation in a DEI-focused CoP influence engineering faculty members' integration of DEI principles into their pedagogical approaches?
- iv. What measurable changes occur in engineering faculty teaching behaviors or classroom practices after sustained participation in the CoP?

Program background

The CoP initiative in the school of Engineering, of the HBCU was launched in the summer of 2024 as a strategic platform to strengthen the capacity of engineering faculty to integrate DEI principles into their teaching and faculty–student interactions. The CoP was designed to cultivate DEI-informed change agents within classrooms by fostering reflective, equity-minded pedagogical practices. Its specific objectives were fourfold: (i) to expand engineering faculty knowledge on key DEI concepts that enhance teaching and learning and support the development of socially conscious future engineers; (ii) to establish a mentoring space where engineering faculty members can openly share successes, challenges, and barriers encountered in implementing DEI in their classrooms; (iii) to improve access to DEI-related resources; and (iv) to contribute to broader organizational change across the School of Engineering by promoting learning environments in which all students feel respected, valued, and included.

To evaluate the effectiveness of the CoP, lecture recordings and classroom activities from ten volunteer faculty members were collected prior to the CoP's introduction. The same courses were reassessed after the faculty completed the training, enabling a comparative analysis of pedagogical changes. There was no prior information to faculties on proposed observations before such observations were carried out. The CoP focused on the creation of inclusive learning environments, the adoption of equitable teaching approaches, and the implementation and ongoing refinement of inclusive practices within faculty–student engagements.

The program consisted of weekly, in-person training and discussion sessions facilitated by experienced instructors. The Cop was led by experienced faculties in DEI from within the

engineering faculty. These sessions provided a comprehensive foundation for embedding DEI into pedagogical approaches and were enriched through contributions from subject-matter experts. Faculty participants received tailored resources to support inclusive classroom strategies and drive meaningful change within their courses, departments, and the wider School of Engineering. The training also fostered a collaborative learning community, offering a supportive environment in which faculty could exchange experiences, share effective practices, and reflect critically on their DEI journeys.

The impact of the CoP on DEI-centered faculty–student engagement was assessed using a validated DEI evaluation instrument. This tool measured changes in course content, the incorporation of inclusive pedagogical practices, and students’ perceptions of inclusion, thereby providing insight into the CoP’s influence on classroom dynamics and learning outcomes.

Conceptual Framework

A CoP is a collaborative learning model rooted in social learning theory, emphasizing collective knowledge-sharing and skill development among individuals with shared goals or interests. At HBCU committed to integrating DEI in teaching methodologies, the CoP framework provides an effective mechanism to engage faculty members in a transformative process of pedagogical innovation and institutional change [16]. The framework employed for this CoP development is grounded in the *Wenger’s CoP model*, which emphasizes a shared domain of interest, community engagement, and practice improvement [19]. The CoP focuses on fostering collaborative learning among faculty to deepen their understanding of DEI and its application in pedagogy [20].

The theoretical underpinnings of the CoP draw on Wenger’s (1998) social learning theory, which highlights the interplay of four core components: meaning, practice, community, and identity. In this context, meaning refers to faculty members’ collective understanding of DEI principles, practice involves the application of these principles in teaching, community signifies the shared commitment to DEI goals, and identity reflects faculty members’ evolution as inclusive educators [21]. This framework situated learning as an inherently social process where individuals co-construct knowledge through participation and reflection [2].

Overall Purpose

The CoP is designed to function as a catalyst for cultural transformation at the institutional level. By equipping faculty members with the tools and mindset necessary to prioritize DEI in their teaching, the initiative aims to enhance student outcomes, foster an inclusive learning environment, and reinforce the university’s mission as a leader in social justice education. Over time, the CoP’s influence is expected to extend beyond individual classrooms, shaping policies and practices that institutionalize DEI as a core value of the university [4, 7].

This theoretical framework (Figure 2) provides a roadmap for the CoP’s development and underscores its potential to create lasting change. By grounding the initiative in established theories and contextualizing it within the unique history and mission of an HBCU, the framework ensures a robust and culturally responsive approach to advancing DEI in teaching methodologies [9, 10, 17].



Figure 1: Wenger's Theoretical Framework for the community of practice

Source: [23]

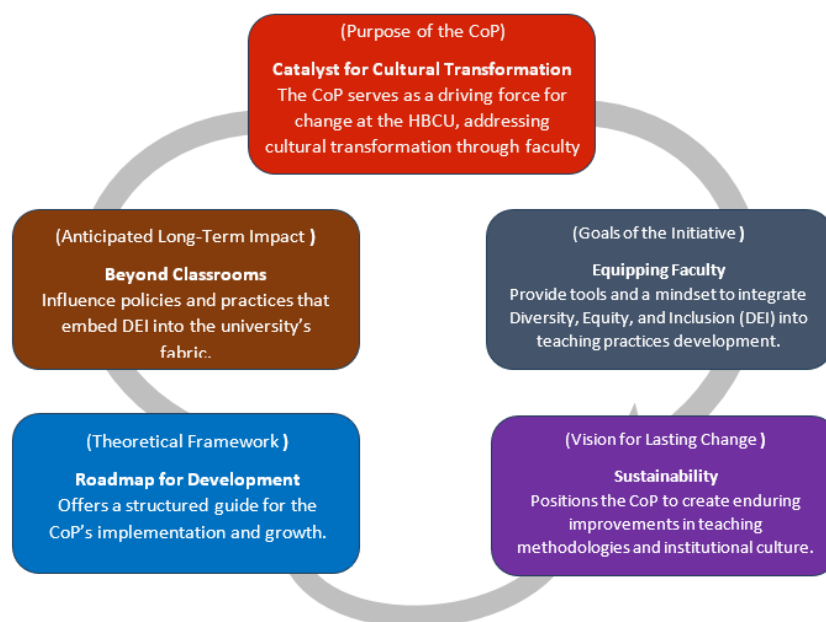


Figure 2: Anticipated Impact on Institutional Culture

Source: Author's contribution

Methods

This study adopted a systematic and iterative approach to develop and evaluate a CoP aimed at enhancing faculty-student engagement with DEI principles within their pedagogical practices. The methodological process comprised the design, implementation, and assessment of the CoP to ensure meaningful participation and measurable impact.

Participant Recruitment

Faculty members from the School of Engineering representing a range of engineering disciplines, career stages, and demographic backgrounds were invited to participate, ensuring a breadth of perspectives within the CoP [5, 7]. Recruitment was conducted through multiple channels, including announcements at faculty meetings, email invitations, and internal communication platforms. Interested participants completed an application outlining their motivation for joining and prior engagement with DEI-related initiatives. This process supported the formation of a diverse yet cohesive group of ten faculty members, facilitating rich discussion while maintaining a manageable size conducive to effective collaboration [4]. All 10 applicants who indicated interest through application forms were selected to participate in the CoP.

Baseline Assessment

A mixed-methods baseline assessment was undertaken to examine existing levels of faculty engagement with DEI. This included both quantitative and qualitative data collection to identify current challenges, areas for pedagogical support, and opportunities for improvement.

Class Recordings and DEI Observation Tool

Classroom recordings served as the primary data source for analyzing faculty implementation of DEI strategies. Observations were conducted in the spring semester prior to CoP participation (pre) and in the subsequent fall semester following sustained engagement (post). For each instructor, one course was observed in the pre period and one in the post period. Courses involved were both undergraduate and graduate course, depending in the ones handled by the participant. While the specific course titles occasionally differed between semesters due to normal teaching assignments, efforts were made to ensure disciplinary and instructional comparability. All recordings were drawn from regularly scheduled class sessions, and faculty were aware that classroom observations would occur as part of the study. However, faculties were not informed about the observation prior to the time it was conducted.

A standardized DEI observation instrument, adapted from the Equity and Inclusion Classroom Observation Protocol, was employed to evaluate classroom interactions, teaching materials, and instructional strategies [7]. Three trained observers, comprising DEI specialists and educational researchers, independently applied the tool to assess the integration of DEI across teaching practices. The instrument generated quantitative scores on indicators such as inclusive language, equitable participation, and culturally responsive content, complemented by qualitative field notes capturing observed strengths and areas requiring improvement [2, 22]. To ensure consistency, inter-rater discussions were conducted, and final scores reflected consensus or averaged values across observers.

CoP Design and Implementation

The CoP was structured around a collaborative learning model incorporating regular meetings, shared resources, and peer engagement. The initiative commenced with a kick-off workshop designed to establish collective goals and build rapport among participants. Thereafter, weekly sessions which lasted for four hours each week over an eight-week period was centred on targeted DEI themes. Such DEI themes include implicit bias, inclusive assessment design, and strategies for facilitating equitable classroom discussions. Faculty collaboratively developed DEI teaching guides and toolkits, while a parallel mentorship scheme paired experienced DEI-

engaged faculty with colleagues newer to the work, providing tailored guidance and reflective support [23]. This structure facilitated sustained engagement, collective problem-solving, and iterative refinement of pedagogical practices. Participants were also made to be aware of indicators of DEI and the evaluation criteria during the training. During the CoP, selected observed classroom sessions were analyzed and discussed anonymously to enhance practical relevance and engagement in the training. However, no formal debriefing sessions were conducted following the post-CoP observations.

The CoP was funded from the National Science Foundation grant on Developing Equity-Minded Engineering Practitioners (DEEP). The CoP is designed to be revisited annually with different cohorts of faculty members to broaden the dissemination and uptake of DEI-grounded pedagogical practices across engineering programs. This will ensure that sustained engagement and reflective community learning contribute to systemic instructional transformation rather than isolated interventions. However, this has not been achieved because of paucity of funds.

Evaluation Framework

A comprehensive evaluation framework combining formative and summative components was employed to assess the CoP's impact. Formative evaluation captured continuous feedback through the DEI observation tool and informal check-ins conducted throughout the CoP. These iterative assessments allowed for real-time adjustments, supporting the ongoing improvement of both CoP activities and faculty practices. Summative evaluation employed multiple strategies to assess overall effectiveness. The DEI observation tool was administered to measure changes in faculty knowledge, attitudes, and confidence related to DEI integration [3, 10]. Classroom recordings collected before and after the intervention were analyzed using a validated DEI assessment instrument to evaluate the extent of change in teaching practice [24].

Data Collection and Analysis

Data collection occurred in two phases prior to the establishment of the CoP and immediately after the faculty participants completed the CoP training. This design enabled a comparative assessment of changes in pedagogical practices and faculty–student engagement influenced by DEI integration.

Application of the DEI Observation Tool

Qualitative Analysis

The qualitative notes generated during classroom observations were analyzed using a two-stage inductive approach. First, descriptive coding was used to summarize observable instructional behaviors related to inclusion, equity, and student engagement. These descriptive codes captured patterns such as inclusive questioning techniques, responsiveness to student needs, or challenges observed in facilitating equitable discussions. In the second stage, thematic analysis was employed to identify recurring patterns across participants. Themes were developed to illustrate shifts in teaching practice, highlight areas of persistent challenge, and contextualize quantitative findings. These themes provided deeper insight into how faculty enacted DEI principles and how their practices evolved through participation in the CoP.

Quantitative Analysis

Quantitative data derived from the DEI observation tool were analyzed to determine statistically significant differences between pre-CoP and post-CoP teaching practices. Chi-Square tests were conducted at $p < 0.05$ for each DEI indicator to compare faculty performance before and after the intervention. This approach allowed assessment of whether participation in the CoP produced measurable improvements in the integration of DEI principles within classroom teaching. Effect sizes were also calculated to determine the magnitude of observed changes. All statistical analyses were conducted using standard procedures for significance testing.

Integration of Quantitative and Qualitative Findings

The mixed-methods analytical approach allowed triangulation of findings. Quantitative improvements detected through Chi-square-tests were examined alongside qualitative themes to provide a comprehensive interpretation of change. This integration enabled a richer understanding of how the CoP influenced faculty behavior, highlighted specific mechanisms of improvement, and identified areas requiring further institutional support.

Limitations

Despite the use of three trained observers, including DEI specialists and educational researchers, the possibility of human error in classroom observation and coding cannot be fully eliminated. Furthermore, the study was conducted within a historically Black college and university (HBCU), where institutional and leadership commitments to DEI are deeply embedded. As such, the transferability of findings to institutions with differing DEI climates may be limited and may introduce contextual challenges not encountered in this setting.

Results

The results are organized around the four research questions, which serve as thematic lenses for interpreting changes observed before and after sustained participation in the CoP. The analysis draws on qualitative content evaluation of classroom observations supported by descriptive statistics and chi-square comparisons.

DEI-Related Challenges Identified by Faculty Prior to Engagement in the CoP

Prior to engaging in the CoP, faculty classrooms exhibited a mix of equity-supportive and equity-limiting instructional practices. Figures 3a and b represent the total DEI indicators count for all participants before and after the CoP. Positive DEI indicators were present, particularly those related to transparent teaching. These emphasize help-seeking, and acknowledging student contributions. However, the pre-CoP observations also revealed several recurring challenges that constrained equitable faculty–student engagement. These challenges included assumptions of homogeneous prior knowledge, frequent use of jargon without explanation, limited accessibility of materials, passive learning formats, and unclear communication. Collectively, these patterns suggest that while faculty demonstrated an awareness of inclusive teaching at an interactional level, structural and design-oriented DEI practices were less consistently embedded prior to CoP participation.

Negative DEI indicators before the CoP further highlighted areas of concern, including limited adjustment of instruction based on student assessment outcomes, explanations framed in deficit-oriented language, and lack of diverse or real-world contextualization of engineering

content. These findings indicate that, before participating in the CoP, faculty faced challenges in aligning instructional practices with equitable learning principles, particularly in addressing accessibility, scaffolding, and diverse student experiences.

Changes in Faculty Awareness, Attitudes, and Reflective Practices Fostered by the CoP

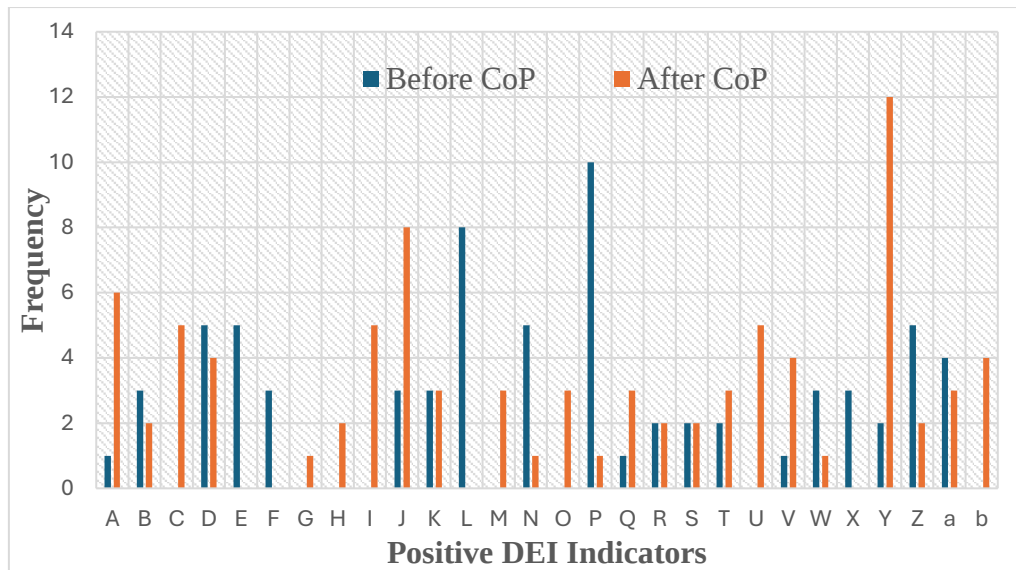
Evidence from post-CoP observations suggests that participation in the CoP fostered meaningful shifts in faculty awareness and reflective teaching practices. After the CoP, faculty demonstrated a broader and more nuanced repertoire of DEI-aligned behaviors, including explicit acknowledgment of uncertainty and errors, normalization of student difficulty, clarification of confusing terminology, and use of accessible analogies. Faculty were also observed engaging more intentionally in reflection-in-action, responding to student confusion, validating questions, and encouraging whole-class participation.

The CoP appeared to function as a reflective space that supported faculty in moving beyond isolated inclusive gestures toward more deliberate and responsive pedagogical practices. The increased presence of practices such as progressive scaffolding, pedagogical transparency, and explicit discussion of equity impacts suggests heightened awareness of how instructional choices influence student engagement and learning. These shifts reflect changes not only in teaching behaviors, but also in underlying attitudes toward inclusivity, responsibility, and continuous pedagogical improvement.

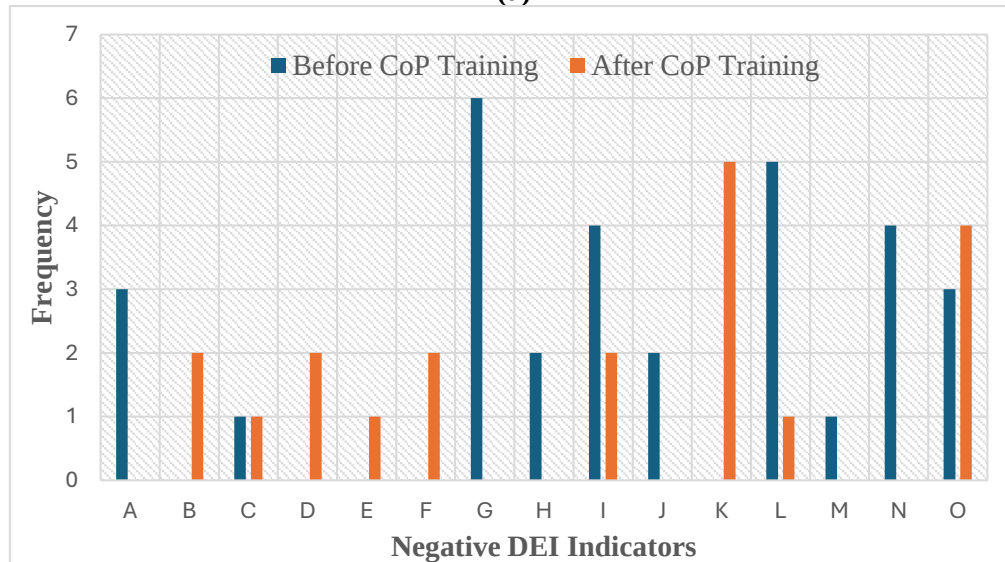
Influence of CoP Participation on the Integration of DEI Principles into Pedagogical Approaches

Comparison of pre- and post-CoP positive DEI indicators indicates an overall increase in the breadth and frequency of equity-aligned instructional practices following CoP participation. Post-CoP observations showed higher counts of positive indicators related to accessibility, flexible assignments, student choice, engagement strategies, and contextualization of engineering content through under-resourced or real-world examples. These practices reflect a more intentional integration of DEI principles into pedagogical approaches, extending beyond interpersonal interactions to include instructional design and content framing.

Statistical comparisons further support these patterns (Table 1). Prior to the CoP (Comparison A), positive DEI indicators significantly outweighed negative indicators, with a large percentage difference and a highly significant chi-square result, indicating an imbalance favoring equity-supportive practices even before training. After CoP participation (Comparison B), positive indicators continued to significantly exceed negative ones, though the magnitude of this difference decreased, reflecting both an increase in positive practices and a concurrent reduction in negative behaviors. Direct comparison of positive DEI indicators before and after the CoP (Comparison C) showed a modest increase that was not statistically significant, suggesting that gains in DEI integration were more strongly reflected in qualitative shifts and diversification of practices than in raw frequency alone. In contrast, negative DEI indicators showed a notable reduction after the CoP (Comparison D), with a meaningful percentage decrease, indicating that participation in the CoP was associated with fewer equity-limiting instructional behaviors.



(a)



(b)

Figure 3: Comparison of Positive and Negative DEI Indicators in Before and After CoP Training in an HBCU

Positive DEI Keys: **A:** Accessibility of materials (focus on ADA dimensions of accessibility); **B:** Allow multiple formats for assignment; **C:** Asks students for example of problem/situation the tool could be applied to; **D:** Asks students for examples of positive outcomes; **E:** Build in flexibility with assignment (e.g., drop one); **F:** Connection to what engineering work life looks like; **G:** Describes plan for/collaboration with affected community as part of the assignment; **H:** Describes assignment/ assessment as using a student-suggested problem; **I:** Describes assignment/ assessment as using real problem; **J:** Describes a technique as a tool for building a more equitable world; **K:** Emphasizes academic capability of collective, group, individual; **L:** Emphasizes help available to all who seek it; **M:** Explains conditions that might affect application in under-resourced community or population (e.g., shortage of water for concrete, insufficient refrigeration for food); **N:** Explains cultural references or terms or examples that some students might not already know; **O:** For in-class problem, uses example from under-resourced community or population; **P:** Instructor gives details about the assignment format and/or provides example(s) and/or links to course objectives, hints about how to be successful, links to the rubric (or any aspect of transparent teaching); **Q:** Instructor is open to disagreement from a student; **R:** Links a topic to a student's/s' known interest; **S:** Mentions career(s) as having potential to positively impact minoritized groups/communities; **T:** Mentions positive outcomes for people from the topic (bridges, circuit boards, cell phones, etc.); **U:** Mentions BIPOC engineer(s); **V:** Mentions research finding of BIPOC engineer(s); **W:** Open to more than one answer/ explanation rather than insisting on one right answer/explanation; **X:** Positively acknowledges a contribution or question; **Y:** Reacts with empathy if a difficult topic comes up; **Z:** Statements that prof does NOT know all; **a:** Statements that prof made an error; **b:** Talks about online options (e.g., if student has sick child).

Negative DEI Keys: **A:** Dismisses the truth or seriousness if a difficult DEI-related topic comes up; **B:** Does not explain cultural references or terms or examples that some students might not already know; **C:** Gives fixed problem sets/projects not tied to DEI; **D:** Ignores or disparages a contribution or question; **E:** Instructor gives discouraging messages such as 'this is a weed-out class'; **F:** Instructor interrupts when not necessary; **G:** Mispronounces name; **H:** Materials are not accessible (focus on ADA dimensions, e.g., lack of captions); **I:** Mentions negative outcomes for people from the content topic (bridges, circuit boards, cell phones, etc.); **J:** Relies on stereotypes when linking a topic to a student's/s' interest; **K:** Refers to a student or group grade/trend; **L:** Suggests help for specific student or group (not 'if you didn't do well on the exam...'); **M:** Suggests help when help is not needed (e.g., pushing someone in a wheelchair); **N:** Uses put-downs (collective, group, individual); **O:** Verbalizes assumptions about a student or group (success, study habits, career aspirations, preparation [not actual exam scores, see below], physical abilities)

Table 1: Statistical Comparison of Positive and Negative DEI Indicators Before and After CoP Training in a HBCU

Comparisons	Percentage Difference and Change (%)	χ^2	p-value
HBCU Positive & Negative DEI Indicators before training (A)	68.09	39.39	<0.001
HBCU Positive & Negative DEI Indicators after training (B)	37.86	14.77	<0.001
HBCU Positive DEI Indicators before and after training (C)	8.38	1.09	0.30
HBCU Negative DEI Indicators before and after training (D)	- 23.07	2.77	0.096

Measurable Changes in Faculty Teaching Behaviors and Classroom Practices After CoP Participation

Post-CoP classroom observations revealed clear and measurable changes in faculty teaching behaviors. Faculty increasingly employed strategies that promoted accessibility, such as the use of accessibility apps, multiple engagement formats, and references to external accessible resources. There was also greater emphasis on student agency through optional engagement levels, student choice in assignments, and encouragement of diverse perspectives. Importantly, faculty demonstrated increased responsiveness during instruction, including addressing confusion in real time, correcting errors openly, and validating student input.

At the same time, negative DEI indicators were less frequent after CoP participation. While challenges such as occasional assumptions about students or references to grade trends persisted, the overall reduction in negative behaviors suggests that sustained engagement in the CoP contributed to more equitable classroom climates. These findings indicate that the CoP supported faculty in translating DEI awareness into observable pedagogical change, particularly by reducing practices that may marginalize students and by expanding the range of inclusive teaching strategies employed. These results demonstrate that participation in a DEI-focused CoP influenced faculty teaching practices by enhancing reflective awareness, broadening the integration of DEI principles, and reducing equity-limiting behaviors in engineering classrooms. The findings provide empirical evidence of how structured, sustained faculty development can shape inclusive pedagogical practices over time.

Discussion

This study examined the impact of a DEI-focused CoP on faculty–student engagement and pedagogical approaches in engineering education by analyzing observed classroom practices before and after sustained participation. The findings indicate that, prior to the CoP, faculty exhibited a combination of equity-supportive behaviors and persistent challenges related to accessibility, assumptions about student preparedness, and limited use of diverse or real-world contexts. These patterns suggest that while many instructors were already engaging in some inclusive practices, DEI integration was often partial and uneven, particularly in structural and design-oriented aspects of teaching.

Participation in the CoP was associated with notable shifts in faculty awareness and reflective practices [25]. Post-CoP observations revealed increased instructor attentiveness to student confusion, greater willingness to acknowledge uncertainty or error, and more intentional use of pedagogical strategies aimed at inclusion and accessibility. These changes suggest that the CoP functioned as a reflective and supportive space that enabled faculty to critically examine their teaching practices and to adopt a more equity-minded stance toward faculty–student

interactions [26]. Rather than simply introducing new techniques, the CoP appeared to cultivate deeper pedagogical reflection that shaped how instructors responded to students in real time.

The influence of the CoP on the integration of DEI principles was most evident in the diversification of inclusive teaching practices and the reduction of equity-limiting behaviours [27]. While the increase in positive DEI indicators was modest in terms of frequency, the qualitative expansion of DEI-aligned strategies, such as progressive scaffolding, flexible engagement options, and explicit attention to equity impacts suggests a meaningful shift in how DEI was enacted in classrooms. More pronounced was the reduction in negative DEI indicators following CoP participation. This reduction in negative DEI indicates that the CoP may be particularly effective in helping faculty recognize and mitigate practices that inadvertently marginalize students.

Collectively, these findings underscore the value of sustained, community-based faculty development for advancing DEI in engineering education. The results suggest that meaningful pedagogical change emerges not solely from increasing the number of inclusive practices, but from fostering reflective awareness that enables faculty to critically evaluate and adjust their instructional behaviors. By demonstrating measurable changes in classroom practices following CoP participation, this study provides evidence that DEI-focused CoP can serve as effective mechanisms for translating equity commitments into tangible pedagogical transformation [27].

Beyond improving classroom practice, these findings point to the broader potential of DEI-focused CoP to reposition engineering education within critical struggles over power, knowledge, and institutional authority. Transforming engineering education communities requires interrogating how technical curricula may reproduce dominant socio-political hierarchies and reorienting them toward justice-centered and community-accountable knowledge production. A liberatory approach calls for collective reflection not only on teaching techniques, but also on whose experiences of marginalized individuals within the engineering spaces. In this sense, DEI-focused CoPs can function as incubators for structurally conscious transformation that can foster engineering communities that resist exclusionary systems while advancing equitable social futures.

Future Directions and Transferability of DEI-Focused Communities of Practice

The future work will prioritize longitudinal and cross-institutional evaluation to determine the sustainability and generalizability of DEI-focused CoP. Replication across diverse institutional contexts, including research-intensive universities, community colleges, and minority-serving institutions, is necessary to assess external validity and identify contextual moderators such as leadership support, institutional culture, and existing DEI infrastructure. A structured implementation framework can also be developed to distinguish core components, such as sustained engagement, peer reflection, observation-based feedback, and accountability, from context-specific adaptations. With systematic refinement and multi-site validation, DEI-focused CoPs can serve as adaptable, evidence-informed mechanisms for advancing inclusive pedagogy across engineering education settings.

Conclusion

This study investigated the impact of a DEI-focused CoP on engineering faculty teaching practices by examining DEI-related challenges prior to participation, shifts in faculty awareness and reflection, and measurable changes in classroom behaviors after sustained engagement. The findings show that, before participating in the CoP, faculty demonstrated a mix of inclusive

instructional practices alongside persistent challenges related to accessibility, assumptions about student preparedness, and limited integration of equity-oriented design features. These results highlight the gap between individual inclusive intent and the systematic enactment of DEI principles in engineering pedagogy.

Participation in the CoP was associated with meaningful changes in faculty attitudes, reflective practices, and instructional behaviors. Post-CoP observations revealed expanded use of inclusive pedagogical strategies, greater responsiveness to student needs, and increased pedagogical transparency, alongside a notable reduction in equity-limiting behaviors. While gains in the frequency of positive DEI indicators were modest, the qualitative diversification of DEI-aligned practices and the reduction of negative indicators suggest that the CoP supported deeper, practice-oriented transformation rather than superficial adoption of techniques.

Future research should examine the long-term sustainability of these pedagogical changes and explore how CoP-driven shifts in teaching practices influence student experiences and learning outcomes. Expanding the study across multiple institutions and disciplinary contexts would further clarify how Communities of Practice can be scaled and adapted to support DEI integration in engineering education. Additionally, incorporating student perspectives and longitudinal observation would strengthen understanding of how faculty development initiatives translate into enduring, equitable learning environments.

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