

Exploring the Impact of Introducing Asset-based Thinking on Faculty Perspectives

Tejashwini Rajashankar
Dept. of Civil Engineering
California State University, Los Angeles
Los Angeles, CA
trajash@calstatela.edu

Marlen Trigueros
Dept. of Civil Engineering
California State University, Los Angeles
Los Angeles, CA
mtrigue6@calstatela

Kenya Z. Mejia
Mechanical Engineering
San Francisco State University
San Francisco, CA
kzmejia@sfsu.edu

Lizabeth Thompson
Dept. of General Engineering
California Polytechnic State University
San Luis Obispo, CA
lschleme@calpoly.edu

Corin L. Bowen
Dept. of Civil Engineering
California State University, Los Angeles
Los Angeles, CA
cbowen5@calstatela.edu

Gustavo Menezes
Dept. of Civil Engineering
California State University, Los Angeles
Los Angeles, CA
gmenezes@calstatela.edu

Abstract—This research, full paper examines the impact of introducing asset-based perspectives on faculty mental models of teaching and learning through participation in a Community of Practice. Ongoing research at California State University, Los Angeles is exploring how faculty perspectives are affected after participating in a community of practice intended to promote asset-based thinking towards students. This research challenges the factory-based framing of engineering education and advocates for an ecosystem model, where all participants—students, faculty, and staff—recognize their interdependence and embrace authenticity. This paper is based on qualitative data from minute papers, or participant reflections. Through inductive qualitative coding of this data, the research team has developed a code book with themes around Insights into Mindsets and Critical Points regarding understanding asset-based perspectives.

Our results, contribute to the conversation about changing mental models, by tracing the journey of different faculty as they learn about asset-based perspective, process their learning through discussion and application, and how introducing this different framework affects faculty perspectives on students. This conversation is particularly important as we continue to create more inclusive classrooms, especially when faculty and students have differing experiences, based on different social identities (e.g. different racial/ethnic identities, socioeconomic status, gender identity). The contributions will also include implications for practice as we understand how faculty consider asset-based perspectives.

Keywords—inclusivity, faculty teaching philosophies, critical pedagogy

I. INTRODUCTION

The Eco-STEM Project aims to shift the analogy of engineering education from a “factory-like” system to one more closely aligned with an ecosystem. California State University, Los Angeles serves a unique student population that is

approximately 70% first-generation, 70% low-income, and 70% Latiné. Much research on secondary education assumes a specific type of student entering college, usually white, male, and from the middle class. Like in a factory model, inputs are assumed to be homogenous and ideally, the outputs are also in a similar form. Products that do not conform to a standard are eliminated through a quality control process. In an ecosystem, each organism is valued for its unique contributions and the ecosystem thrives because diversity is encouraged. This project is looking to develop a model for Engineering Education Ecosystem, where students, faculty, and staff can all thrive while bringing their full selves. In this scenario, universities must learn to be “student-ready” as opposed to students having to be “college-ready.” This paper aims to expand conversations of Broadening Participation to look at the mental models in place regarding the educational system. In shifting from a factory model to a more ecosystem-like model, this work hopes to encourage others in the community to think about what assumptions are being made about the framework of educational systems.

II. RELATED WORK

We situate this work with other research on Broadening Participation in Engineering Education, using a critical approach to understand and build on faculty perspectives on teaching.

A. Broadening Participation in Engineering

The engineering education community has been looking to broaden participation in engineering to include more women and underrepresented minorities for decades through both recruitment and retention [1], [2], [3], [4], [5]. The research presented here is done in the context of improving retention, thinking about how faculty perspectives influence the advancement of an inclusive culture through inclusive pedagogical practices. Having inclusive pedagogy requires an intentional approach to how one develops and delivers content

and who one has in mind when creating this content. Research has shown the positive impact faculty interactions and constructive feedback can have on students' professional skills [6]. Additionally, faculty can also have an impact on students' intellectual growth and beliefs of personal ability [7]. This paper aims to build on this work by looking to understand how introducing asset-based perspectives and comparing them to deficit-based perspectives can influence how faculty approach teaching and learning. The asset-based model the research team has focused on is Tara Yosso's critical framework, Community Cultural Wealth [8].

B. Community Cultural Wealth

Community Cultural Wealth "draws on the knowledges Students of Color bring with them from their homes and communities into the classroom," countering the dominant narrative that students coming from marginalized communities have deficits, such as low academic preparedness, that universities must overcome. Critical scholars in Engineering Education have emphasized the importance of adopting this perspective to help dismantle cultural barriers to inclusion. Denton et al. found that most research studies in engineering education using Community Cultural Wealth focused on interviews with students [9], [10], [11] and recommended the community look to gather insights about the framework from other community members such as faculty, staff, and even student family members [12]. This paper is looking at the impact of introducing Community Cultural Wealth on faculty perspectives of teaching and learning. This is particularly important for our university setting, which is a majority minority institution. The final connection for our work is previous research looking at common faculty mindsets on teaching and learning in engineering education.

C. Faculty Mindsets on Teaching

One main aspect of this project is to understand engineering cultural norms that impact faculty ideas of teaching and learning. Previous work has shown that faculty can think of quality teaching in three ways: as associated with elitism and restricted access, as a transformational perspective, or as fitness of purpose as related to meeting learning objectives [13]. Asset-based perspectives most complements a transformational perspective, but how can we help engineering educators with other perspectives also embed asset-based perspectives into their teaching philosophies? Other work has named practices that faculty find effective [14]. More recent work looks specifically at faculty understanding of inclusive practices as related to diversity, equity, and inclusion [15].

Overall, the goal of this work is to understand how introducing asset-based perspectives, specifically Community Cultural Wealth, through faculty development can help the effort of broadening participation in engineering education, given the impact faculty and their perspectives on teaching can have on student trajectories.

III. METHODS

The foundation of the Project are faculty communities of practice that take place over one academic year. Details of what is covered in these communities of practice can be found in previous work [16], [17].

The data for this paper includes participant reflection responses pinpointing both challenges ("muddy points") and enlightening moments ("aha points"). Throughout the sessions, a participatory approach was promoted to create an engaging dialogue among faculty members and the research team. These dialogues illuminated diverse aspects participants took away, such as its practical application, obstacles encountered, and potential advantages for a classroom setting.

In total, our workshops engaged 13 participants, comprising of faculty members from various departments and disciplines in Science, Technology, Engineering, and Math (STEM). For focused analysis, we chose to focus on five of the thirteen participants. These five participants were chosen because of their lengthier response. These participants were each given pseudonyms, based on gender identity and discipline. Each of the five participants included in this paper teach in an Engineering discipline and therefore have pseudonyms that start with an "E." The participant pseudonyms include Elsa, Evie, and Evelyn, all female faculty. Additionally, Edward and Esteban are male faculty.

Initially, all participants' reflections were subjected to our qualitative coding process. Utilizing the principles outlined by Saldaña [18], this study employs inductive qualitative coding to analyze the experiences of faculty members as they engage with asset-based perspectives. The analysis process involved the iterative development of codes from the data collected. Initially, descriptive codes were assigned to capture the essence of participant feedback. This first cycle of coding was followed by a focused coding phase, where codes were categorized based on their frequency and significance. This methodological rigor allowed for the emergence of themes that accurately represented our participants' collective experiences and perspectives.

IV. RESULTS

In this section, we report the results of the research. In following the inductive coding process, the research team found that participant reflections fell into two main themes: Insights into Mindset and Critical Points. Each of these main codes have a set of sub-codes that further synthesize the type of comments participants made in their reflections. The definition of each Codes and Sub-code can be found in Table 1 below. The following sections define each code and sub-code and provide participant quotes that illustrate their significance.

A. Insights into Mindset

The code "Insights into Mindset" denotes participant reflections that help the research team understand the individual's set of beliefs and attitudes towards learning and teaching. Two subcodes were developed including Learning from Peers and Faculty Growth Mindset. Overall, we see that faculty involved in this study already valued learning from their peers and had a Growth Mindset towards their ability to improve their teaching. The following sections define these two sub-codes and provide example quotes.

1) Learning from Peers

Faculty often mentioned appreciating when insights came from learning and supporting each other in the faculty

TABLE I. CODES AND SUB-CODES

Code	Definition	
Insights into Mindset	an individual's set of beliefs and attitudes towards learning, teaching, and interactions.	
	Sub-code	Definition
	Learning from Peers	Individuals value learning from and supporting each other, often through group work and discussions.
	Faculty Growth Mindset	The belief in the potential to grow and improve through effort, challenges, and perseverance.
Critical Points	a sudden realization or understanding that brings clarity to a complex issue, often leading to a new perspective or approach.	
	Sub-code	Definition
	Utilizing Community Cultural Wealth	The recognition and leveraging of diverse cultural backgrounds, experiences, and perspectives.
	Inclusive Teaching Dilemmas	Concerns over using educational techniques that accommodate and acknowledge diverse student backgrounds, learning preferences, and skill levels.
	Educational System	Developing an understanding of systemic limitations within the education system, especially regarding its capacity to accommodate the diverse needs and backgrounds of all students.
	Awareness of Social Identity	An individuals' evolving understanding of complex social issues and personal identities within educational settings.

community of practice, either through group work or discussions. These reflections were coded as Learning from Peers. Faculty appreciated the opportunity to listen to others' experiences and pedagogical strategies.

A primary example can be seen in Evelyn's reflection from session five stating,

"When I have assigned students to groups in the past, I tended to think 'higher performing' students mixed with 'lower performing students.' In talking with Elder about his project, he made me think about grouping by learning style. I loved that he does that, and [it] is going to make me think more about students' learning style rather than their performance."

Here, Evelyn reveals that she gained insight into the grouping of students by learning style rather than performance, highlighting her openness to learning from peers' practices.

Another example can be found in Edwards' "aha" reflection from session one where he lists, *"Group sharing and feeling connected with everyone"* as something he appreciated from the session.

Another example can be seen in Elsa's reflection from session three where she states, *"Some of the strategies shared in the Padlet, [a collaborative application], will be useful. I just have to think more about it."* Here she is acknowledging the usefulness of strategies shared by peers on a platform like Padlet [19] demonstrating the uptake of peer-generated ideas and resources. Esteban shares a similar sentiment and says, *"I really*

liked the activity on 'The philosophies of teaching and learning.' The Padlet discussions were interesting and there are a few ideas on there that I want to try." Finally, in Esteban's reflection from session three he states, *"A few aha moments, most of them happen during the [community cultural] wealth discussions"* also points to moments of learning from his peers. Given that this was intended to be a Community of Practice, it is good to hear faculty were taking the opportunity to learn from each other. The next sub-code, Faculty Growth Mindset, gives us an insight on faculty views on their own development as educators.

2) Faculty Growth Mindset

Participants expressed a strong belief in the potential for growth and improvement of their teaching through effort and perseverance. This belief, which we categorize as Growth Mindset, from Carol Dweck's theory of motivation, the belief that your basic qualities are things you can cultivate through your efforts, your strategies, and help from others [20], played a significant role in understanding this set of faculty's approach to teaching and student engagement.

Evie conveyed a sense of empowerment in making positive changes in her classroom, emphasizing, *"I can make changes in my classroom! I can help students in my classroom at least."* This highlights the proactive attitude educators have toward enhancing their teaching practices and student outcomes.

Edward underscored the value of learning from all experiences, stating, *"There is not one perfect teaching technique. We can learn from both our positive and negative*

experiences.” This perspective reinforces the idea that challenges and setbacks are opportunities for growth and learning.

Evelyn discussed her ongoing reflection on teaching practices, mentioning,

“While I believe after reflecting more on my teaching practices, I think I have been drawing upon assets rather than having a deficit-thinking framework, I still find myself fighting against deficit thinking.”

This illustrates the continuous effort to adopt a positive, growth-oriented mindset despite occasional struggles with negative thinking. Overall, faculty showed a commitment to a growth mindset through their willingness to adapt, reflect, and support their students’ potential for growth and success.

From these two subcodes, we get an insight into the kind of shared beliefs faculty in this cohort had: they valued learning from each other and they were willing to learn and grow their teaching practice, despite obstacles. The next section on Critical Points highlights the type of questions faculty were grappling with as they were learned about concepts related to asset-based perspectives.

B. Critical Points

Participant reflections coded with “Critical Points” illustrate instances when a participant had a realization or understanding that brought them to question current beliefs or assumptions. Within Critical Points, the research team sub-coded reflections with the type of Critical Points each reflection described including insights about the concept of Community Cultural Wealth, a topic extensively covered in the sessions, Inclusive Teaching Dilemmas, Educational Systems, and Awareness of Social Identities. These Critical Points emerged from the reflections of educators and offer valuable perspectives on the complexities of understanding asset-based perspectives to develop more inclusive teaching practices within academia.

1) Cultural Wealth

Participants understood the importance of recognizing and leveraging diverse cultural backgrounds, experiences, and perspectives, using the concept of Community Cultural Wealth, which was introduced in the Community of Practice. This approach involves incorporating elements of students’ cultural identities into the learning environment to enhance engagement and learning outcomes. In this section, we see faculty grappling to understand how to move forward with this concept.

For instance, Esteban mentioned practical strategies such as *“bringing food to class, playing relatable background music, letting students answer other students’ questions”* as ways to help create a more inclusive and relatable classroom atmosphere, fostering a sense of belonging among students.

Elsa expressed a shift in her perspective, moving away from a deficit-focused approach to one that acknowledges and builds upon students’ existing cultural assets. She states,

“I enjoyed the readings [on Community Cultural Wealth], I don’t think anything was confusing, I mostly have to think about how I can bank on my students’ cultural wealth,”

and further reflected,

“I have always focused on filling the deficit, assuming it was there, I want to shift this to better understand my students and meeting them where they are.”

Edward also explores ways to recognize and promote students’ cultural assets actively. He shared his thoughts, saying,

“I want to focus on recognizing ‘cultural assets’ ... I’m trying to figure out what it means to acknowledge students’ past experience. Also, I really want to focus on promoting growth of motivated and deep learning, but I am struggling to understand some of the associated behaviors ... I also need to put a lot more thought into how to get students to generate their own explanations [and] justify their ideas. I love trying to draw out students’ thought process, but even after 10+ years of teaching, I still haven’t figured out how to do this effectively.”

Evelyn acknowledged the importance of Cultural Wealth. However, she admits struggling with how to best “bring out” some of these aspects of Cultural Wealth from students. She says,

“I think I do a lot of tapping into aspirational capital. And perhaps resistant capital. I think maybe because these are the capital[s] I most rely on? I also want to draw more on familial capital. Even though I would probably consider that one of the two most important assets in the model, I’m not sure I’m really bringing that out in students.”

Evelyn also says,

“When students want to schedule extra office hours at the end of the semester to catch up on things they weren’t doing well on all throughout the semester, is it deficit-thinking to think they weren’t managing their time well or prioritizing their schoolwork?”

Overall, participants emphasized the need to embrace and utilize students’ Cultural Wealth to enhance their learning experiences, though they also noted challenges in implementing these practices effectively. The recognition of Cultural Wealth is seen as a vital component in fostering a more inclusive and engaging educational environment, yet its application is not straight forward. In the following section, we see other dilemmas faculty encountered when thinking about implementing inclusive practices.

2) Inclusive Teaching Dilemmas

Participants discussed the significance of implementing inclusive teaching practices, which cater to the diverse backgrounds, learning styles, and skill levels of students, but also struggled with the realities of doing so. This sub-code encompasses various strategies and reflections from educators striving to create an equitable learning environment, which often comes with personal dilemmas on how to best be inclusive.

Evie emphasized the importance of being mindful with word choices to maintain an inclusive classroom atmosphere, reflecting a commitment to fostering respect and understanding among students. She states, *“I should be more careful with my word choices to ensure an inclusive classroom environment.”*

Elsa expressed her frustration with potential barriers she unintentionally created for student progress in her classroom. She says,

"I should really stop worrying about keeping everyone on the same pace and worry about supplementing knowledge when it is needed for everyone and allowing students to take on their autonomy and move forward. I [open] CANVAS modules based on the syllabus and I'm going to stop doing that. Why am I preventing students from moving forward...I have time now and I want to move into next week's module, but it is locked by date."

This highlights how some common practices inadvertently hinder student advancement.

Edward brought attention to the complexities of discussing aspects of identity, such as economic privilege, within the classroom. He shared,

"Sometimes, I feel, highlighting certain parts of identity (having a super affluent childhood supporting higher education from a very young age, for example) will build some kind of barriers with some students (a few Cal State LA students who might be financially struggling and are/or first-generation students), especially given the very limited time of the semester."

This underscores the challenge of addressing diverse experiences without alienating students.

Evelyn reflected on the tension between covering course material and engaging in the aspects of teaching she values most. She noted,

"I'm so focused on what we need to 'cover' for the class period, that I think I neglect to do some of the things I love about teaching. I need to figure out how to make a more relaxed atmosphere but still be productive and efficient in the classroom."

This suggests a need to balance curriculum demands with inclusive and engaging teaching practices. Overall, faculty grappled with how some of their current practices could actually be exclusive and the difficulties of incorporating inclusive practices that could lead to new issues that would need addressing in the classroom. In the next section, we see how faculty start seeing how their own practice fits within the larger Educational System.

3) Educational System

From reading participant reflections, we often encountered a moment that brought clarity to complex issues. When these points led to understanding systemic limitations within the education system, we denoted these points as Educational System.

We can see a Critical Point into Understanding the Educational System in Evie's session five reflection, where she states: *"Our education system has not been designed to accommodate all students from diverse backgrounds."* In this aha moment, she realized that one of the education system's limitations was the lack of flexibility for students with diverse backgrounds.

Another example is Evelyn's reflection in session one where she expressed,

"...why do our students who are all low-income and have to commute to campus because they cannot, can't afford housing, [have to] pay 3 [times] the parking fee as us faculty? Or why do we add more signatures and approvals in holding student organization events when we should encourage the students who are putting in the effort and energy and have the motivation to serve the larger student body and isn't that what the faculty advisor is for..."

It is clear to see that in this specific "muddy" point, Evelyn is questioning why systemic limitations are held in places that negatively impact students, specifically low-income students who already experience barriers to education. She is openly reflecting on her questions.

Subsequently the same idea continues in Evelyn's reflection from session three stating, *"Instead, I feel like we should take the focus off the material wealth (e.g., frequenting Disneyland) and know that investing in people will pay off much more,"* here she is advocating for a shift in priorities towards investing in people, which has implications for how resources are allocated and educational goals are defined within the educational system. She continues, *"If we are doing a good job educating our students, it's because of the dedication of people, not because of the facilities or lack thereof."* Here she highlights her insight into the human dimension of education and underscores the essential role of dedicated individuals in shaping educational experiences and outcomes.

Evie and Evelyn's reflections collectively underscore systemic challenges within the education system, particularly in accommodating diverse student backgrounds and ensuring equitable resource allocation. Finally, as faculty understand not just the role of inclusive practices in their classroom but the effects of systemic issues on students, faculty also grow in their understanding of how social identities play a role in the ecosystem.

4) Awareness of Social Identity

When the reflections became focused on the individuals' evolving understanding of complex social issues and personal identities within educational settings, we denoted them "Awareness of Social Identity." One example can be found in Edward's reflection from session two where he states, *"Also, sharing identity is much more complex than what I understood from the provided reading."* In this quote Edward reflects an evolving understanding of personal identity within educational settings. In session one, one of Edward's muddy points is that *"... Identities can [be] dynamic and fluid."* Here he is highlighting an increased understanding of the dynamic nature of identities. These reflections for Edward are consistent in that he is truly looking at his own identity, as seen in section B2, Inclusive Teaching Dilemmas.

Continuing with Edward, we can see another example in his reflection from session two where he states,

"Common traits in negative teaching [and] learning memories [include]: ... understating (not prioritizing) students and/or class..., micromanaging students and wanting them to do things in a very specific way,

marginalizes certain people based on gender, race, or others, maybe due to conservative caution...

This quote illustrates an awareness of the complexity of the role social identities within educational settings. These concerns regarding negative teaching indicate an understanding of how these behaviors can impact student experiences.

Another reflection that exemplifies Awareness of Social Identity, is Elsa's muddy point from session one where she states, *"The conversation about the paper where the guy doesn't think there are gender or race issues."* She is referring to an ASEE Video [21], that highlights sexism in engineering. Including this in a muddy point suggests she still had some confusion about the person's understanding of identity issues. Another example can be seen in Esteban's reflection from session one where he states, *"One aha moment was on the identity activities."* In this reflection Esteban suggests a moment of insight into personal identity development.

Next, we can look to Evelyn's reflection for more examples, such as her reflection from session three where she states, *"They [students] have enough to deal with, so where do we want them to invest the cognitive energy they have?"* Evelyn is demonstrating an awareness of the challenges and complexities faced by individuals within a social context. Reflecting consideration for the cognitive and emotional burden placed on students, suggesting an understanding of the importance of directing cognitive energy towards meaningful and impactful endeavors.

Another example can be found in Evelyn's reflection from session three where she states, *"I do recognize that [students] often feel they have to put a lower priority on schoolwork because they need the income from part-time jobs."* Here she is demonstrating an understanding of the intersection between socioeconomic factors and educational opportunities. She reflects an awareness of the challenges faced by individuals balancing academic pursuits with financial responsibilities.

We can also look to Elsa for examples such as her reflection from session one where she states,

"Ethan mentioned people feel comfortable saying things about people of color or gender [around him] because he is a White male and Ethan should be exposed to strategies to educate that person...I think that is something we should talk about because we all have colleagues like this."

In these quotes Elsa's reflection on Ethan's suggestion to educate others on sensitive topics reflects a form of peer support, where individuals help each other navigate challenging situations and learn from each other's experiences that are unique to their intersecting identities.

The reflections categorized under Critical Points: Awareness of Social Identity demonstrate that conversations about identity were salient to participants. For some faculty, these conversations helped them see the impact of identity on the lives of their students. Other faculty spent time thinking about the complex nature of their own identity.

Overall, one of the main findings of this work is the insight we get into what concepts resonated with faculty and the type of questions these conversations surfaced for faculty. In the

following section, we discuss what we learn from analyzing faculty reflections after being introduced to Community Cultural Wealth, an asset-based perspective.

V. DISCUSSION

A. Incoming Mindsets

One important aspect we want to acknowledge is the reality that many of the participants already had a "transformational" approach to engineering education as named by McNeil and Ohland, given that they signed up to be a part of a year-long engagement on developing more inclusive teaching practices. We saw this as they were open to changing their own pedagogical practices and learning to be better educators with a Growth Mindset. Faculty in this study were also very open to learning new approaches from their colleagues. But the other two approaches to effective teaching also surfaced in faculty reflections. Some of faculty's Critical Points came when asset-based perspectives became at odds with ideas of teaching as associated with elitism and restricted access or with teaching as related to meeting learning objectives. In the next section, we discuss why asset-based perspectives conflict with the two other views on teaching named by McNeil and Ohland and how engineering culture and norms exacerbate the mismatch between asset-based perspectives and these two other views on teaching.

B. When Asset-based Perspectives are at Odds with Engineering Norms

Some of the biggest insights we gain from looking at faculty "Critical Points" are points in which there are some disorienting dilemmas [22] between their current ways of viewing teaching and the newly learned concepts regarding asset-based perspectives. According to DeAngelis, disorienting dilemmas "may be thought of as times when new information causes a person to call into question their values, beliefs, or assumptions [23]." Although the research team did not begin with disorienting dilemmas, the research team did seek to have reflective dialogue and personal reflection be a part of the Community of Practice. We see some of these disorienting dilemmas as faculty try to make sense of asset-based perspectives in a traditionally meritocratic view of learning, where success is credited to hard work and natural abilities. Both Elsa and Evelyn question current practices they currently have, created with the best intentions in mind. Elsa says, *"I should really stop worrying about keeping everyone on the same page..."* and Evelyn says, *"I'm so focused on what we need to 'cover' for the class period, that I think I neglect to do some of the things I love about teaching."* Both faculty members are realizing that maybe being a good educator does not mean keeping everyone on the same page or covering every aspect of the material. We see that both Evelyn and Elsa want to incorporate Community Cultural Wealth in their teaching, but also acknowledge that deficit thinking is hard to avoid.

When it comes to looking at systemic issues, both Evie and Evelyn grapple with the realization that the current system is not designed with marginalized students in mind, and in fact, many of the policies and procedures add barriers to success for these students. Again, when thinking of Engineering Education as a meritocratic system, seeing how the system creates barriers for

some and not others lead to incongruent understanding of how things are said to work.

Finally, when faculty learned about the impact of social identity on teaching and learning, many made connections to the complexities of identity. This is particularly relevant within the culture of engineering that seeks to be objective and devoid of feelings [24]. Here, faculty are acknowledging that educators can add to students' marginalization. The instances that stand out to Elsa are clear examples shared about discrimination. The first is the video about a reviewer claiming he has not seen racism or sexism in engineering, yet clearly naming examples of such. Elsa also recalls that Ethan, a white, male faculty member, shares that others feel comfortable making sexist and racist comments around him due to his identity. In hearing both scenarios, Elsa is looking to make sense of how these two examples can be true in a self-declared objective culture. It is through these Critical Points that we are able to explore the disorienting dilemmas faculty face when learning about asset-based perspectives that conflict with cultural ideals in engineering such as meritocracy, objectivity, and the absence of emotions.

C. Implications for Practice

Critical to understanding these faculty reflections is that the asset-based perspectives of Community Cultural Wealth come from Critical Race Theory Scholars. Therefore, the conversations that occurred in the Communities of Practices highlighted systems of power in engineering education that are normally invisible due to their normative nature. Due to this intentional choice of including critical perspective, we see faculty grappling with majoritarian narratives of the engineering education system and the new concepts that honor the voices of marginalized identities. These disorienting dilemmas that occur are important because most of the faculty at [University Name] attended R1 institutions, where this majoritarian narrative is dominant due to the predominantly majoritarian student body, faculty, and staff. The social realities at this institution are different, which emphasizes the incongruencies in using majoritarian perspectives to educate students coming from marginalized communities. Although the current analysis does not include the element of time, future work related to this project will delve into the effects of this asset-based perspective on faculty mental models of teaching after a year or more out from the end of the Community of Practice. Despite the element of time, understanding in-the-moment perspective leads to the following implication for practice for those seeking to incorporate asset-based perspectives into their model of educating engineers.

1) Meeting Faculty Where They Are

Returning to the analogy of engineering education as an ecosystem, we must apply this principle of "meeting students where they are at" to our faculty. Here we acknowledge that this particular cohort of faculty already came with a Growth Mindset toward their teaching and a willingness to learn from their colleagues. But this might not always be the case, something we experience with future cohorts, and which we will have to analyze later. Disorienting dilemmas do not require people to be at any particular place in their learning, therefore, the questions we should be asking is where might there be some

incongruencies with current faculty beliefs and values that we might be able to present in a meaningful way. In addition to presenting, reflection will also continue to be important to the sense-making process, which leads to our next implication: Incorporating Reflection at Various Levels.

2) Incorporating Reflection at Various Levels

Inspired by Critical Education Scholars, the research team made reflection a common part of the Community of Practice both through Critically Reflective Dialogue and personal reflection through these "muddy points" and "aha moments." But as we see in the participant quotes, it is through the discussions with their peers and their personal reflections that faculty were able to name and grapple with these disorienting dilemmas. Therefore, find ways to incorporate reflection for faculty as they learn about asset-based perspectives, which often conflict with beliefs and values in engineering.

VI. CONCLUSION

In this paper, we present faculty reflections after learning about asset-based perspectives for their teaching. Although the engagement itself includes a year-long Community of Practice, the data here is only the faculty reflections collected in the first semester. Using inductive thematic analysis, we found that faculty reflections fell into two broad themes, Insights into Faculty Mindsets, where faculty revealed some of their current beliefs about their teaching and learning, and Critical Points, where faculty grappled with their current beliefs of teaching and learning, and this different, asset-based perspective. In Insights into Faculty Mindsets, faculty revealed a Growth Mindset to their teaching and a willingness to learn from their colleagues. In Critical Points, faculty expressed willingness, yet difficulty with incorporating Community Cultural Wealth into their practice. Faculty also mentioned Inclusive Teaching Dilemmas they encountered, a deeper understanding of the conflicting nature of the Education System, and the complexities of Identity and their impact on teaching and learning.

From these results, we see that the incongruencies faculty face come from faculty views on effective teaching, along with engineering cultural norms associated with achieving success in engineering. Finally, we encourage the engineering community to Meet Faculty Where They Are, when it comes to introducing concepts from Critical Education Scholarship and to incorporate various methods of reflection. Only in this stopping to question and make sense of current beliefs of teaching and learning can we as a community incorporate this asset-based perspective that requires a shift in thinking.

ACKNOWLEDGMENT

The authors would like to thank participants in all of the Communities of Practice. We are incredibly honored to journey alongside you as we pursue a more inclusive engineering education experience for all.

This material is based upon work supported by the National Science Foundation under Grant No. 2013630. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

REFERENCES

- [1] C. Paguyo, R. Atadero, K. Rambo-Hernandez, and J. Francis, "Creating Inclusive Environments in First-year Engineering Classes to Support Student Retention and Learning," in *2015 ASEE Annual Conference and Exposition Proceedings*, Seattle, Washington: ASEE Conferences, Jun. 2015, p. 26.418.1-26.418.16. doi: 10.18260/p.23757.
- [2] A. Sithole, E. T. Chiyaka, P. McCarthy, D. M. Mupinga, B. K. Bucklein, and J. Kibirige, "Student Attraction, Persistence and Retention in STEM Programs: Successes and Continuing Challenges," *High. Educ. Stud.*, vol. 7, no. 1, p. 46, Jan. 2017, doi: 10.5539/hes.v7n1p46.
- [3] J. Mills and M. Ayre, "Implementing an inclusive curriculum for women in engineering education," *J. Prof. Issues Eng. Educ. Pract.*, vol. 129, no. 4, pp. 203–210, 2003.
- [4] M. M. Uddin and K. Johnson, "Engineering Faculty & Staff Inclusive Excellence Training: Broadening Engineering Pedagogy For All," 2023, doi: 10.21427/CFAE-K616.
- [5] J. E. Mills *et al.*, *Guidelines for the design of inclusive engineering education programs*. University of South Australia: University of South Australia - School of NBE, 2010.
- [6] S. A. Bjorklund, J. M. Parente, and D. Sathianathan, "Effects of Faculty Interaction and Feedback on Gains in Student Skills*," *J. Eng. Educ.*, vol. 93, no. 2, pp. 153–160, 2004, doi: 10.1002/j.2168-9830.2004.tb00799.x.
- [7] H. R. Clements, B. B. McIntyre, A. Godwin, J. A. Rohde, and S. Chen, "'Adversary or Ally': Undergraduate Engineering Students' Perceptions of Faculty," presented at the 2020 ASEE Virtual Annual Conference Content Access, Jun. 2020. Accessed: May 01, 2023. [Online]. Available: <https://peer.asee.org/adversary-or-ally-undergraduate-engineering-students-perceptions-of-faculty>
- [8] T. J. Yosso *, "Whose culture has capital? A critical race theory discussion of community cultural wealth," *Race Ethn. Educ.*, vol. 8, no. 1, pp. 69–91, Mar. 2005, doi: 10.1080/1361332052000341006.
- [9] C. Mobley and C. E. Brawner, "'Life prepared me well for succeeding': The Enactment of Community Cultural Wealth, Experiential Capital, and Transfer Student Capital by First-Generation Engineering Transfer Students," *Community Coll. J. Res. Pract.*, vol. 43, no. 5, pp. 353–369, May 2019, doi: 10.1080/10668926.2018.1484823.
- [10] C. C. Samuelson and E. Litzler, "Community Cultural Wealth: An Assets-Based Approach to Persistence of Engineering Students of Color," *J. Eng. Educ.*, vol. 105, no. 1, pp. 93–117, 2016, doi: 10.1002/jee.20110.
- [11] M. Ong, N. Jaumot-Pascual, and L. T. Ko, "Research literature on women of color in undergraduate engineering education: A systematic thematic synthesis," *J. Eng. Educ.*, vol. 109, no. 3, pp. 581–615, Jul. 2020, doi: 10.1002/jee.20345.
- [12] M. Denton, M. Borrego, and A. Boklage, "Community cultural wealth in science, technology, engineering, and mathematics education: A systematic review," *J. Eng. Educ.*, vol. 109, no. 3, pp. 556–580, Jul. 2020, doi: 10.1002/jee.20322.
- [13] J. C. McNeil and M. W. Ohland, "Engineering Faculty Perspectives on the Nature of Quality Teaching," p. 11.
- [14] S. M. Lord and M. M. Camacho, "Effective teaching practices: Preliminary analysis of engineering educators," in *2007 37th Annual Frontiers In Education Conference - Global Engineering: Knowledge Without Borders, Opportunities Without Passports*, Oct. 2007, pp. F3C-7-F3C-12. doi: 10.1109/FIE.2007.4417881.
- [15] S. M. Linder, C. M. Lee, S. K. Stefl, and K. A. High, *Handbook of STEM Faculty Development*. IAP, 2022.
- [16] C. R. Nazar, L. L. Thompson, C. L. Bowen, and G. B. Menezes, "Work in Progress: Developing a Leadership Community of Practice Toward a Healthy Educational Ecosystem," presented at the 2023 ASEE Annual Conference & Exposition, Jun. 2023. Accessed: Sep. 14, 2023. [Online]. Available: <https://peer.asee.org/work-in-progress-developing-a-leadership-community-of-practice-toward-a-healthy-educational-ecosystem>
- [17] N. Warter-Perez, C. Bowen, J. Mijares, D. Galvan, L. Thompson, and G. Menezes, "Work In Progress: Developing a Faculty Community of Practice to Support a Healthy Educational Ecosystem," presented at the 2022 ASEE Annual Conference & Exposition, Aug. 2022. Accessed: Sep. 14, 2023. [Online]. Available: <https://peer.asee.org/work-in-progress-developing-a-faculty-community-of-practice-to-support-a-healthy-educational-ecosystem>
- [18] J. Saldaña, *The coding manual for qualitative researchers*. Sage, 2015. [Online]. Available: https://books.google.com/books?hl=en&lr=&id=ZhxiCgAAQBAJ&oi=fnd&pg=PP1&dq=The+Coding+Manual+for+Qualitative+Researchers&ots=yH_i4BRWcX&sig=DmS5HkkrV7j9ZaSTjgPD_uXmQ
- [19] "Padlet: Beauty will save the work," Padlet. Accessed: May 20, 2024. [Online]. Available: <https://padlet.com/>
- [20] C. S. Dweck, *Mindset: The New Psychology of Success*. Ballantine Books, 2008.
- [21] Linda Vanasupa, *An emancipatory teaching practice in a technical course*, (Jun. 23, 2020). Accessed: Feb. 08, 2024. [Online Video]. Available: <https://www.youtube.com/watch?v=FYPidpLIMxM>
- [22] J. Mezirow, *Transformative Dimensions of Adult Learning*. San Francisco: Jossey-Bass, 1991.
- [23] L. DeAngelis, "Enabling the Exploration of Disorienting Dilemma in the Classroom," *J. Educ.*, vol. 202, no. 4, pp. 585–600, Oct. 2022, doi: 10.1177/0022057421991865.
- [24] D. Riley, "Engineering and Social Justice," *Synth. Lect. Eng. Technol. Soc.*, vol. 3, no. 1, pp. 1–152, Jan. 2008, doi: 10.2200/S00117ED1V01Y200805ETS007.