

LEARNING FROM ANTIRACIST THEORIES TO REFRAME ENGINEERING EDUCATION RESEARCH ON RACE

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In this paper, we describe multiple theories that focus on the production and reproduction of demographic marginalization and that reject deficit paradigms. These theories have developed in disciplinary spaces that focus on first-order theorizing on race. Some have connections to critical race theory (CRT), while others are sociocultural theories; all are theories we have found to be valuable, important, and underused in engineering education. We introduce nine theoretical frameworks: racial and vocational identity development, color-blind racism, funds of knowledge, antideficit achievement, community cultural wealth (CCW), Nepantla, in/authenticity, ruling relations, and racialized organizations and the history of racist ideas. In each framework, we describe how we have understood the theory, how it has been used in the literature, how we have applied it to engineering education research questions and contexts, the struggles we have had in so doing, and further cautions on how it could be misused. We conclude with an overarching set of guiding principles that can support researchers' application of the frameworks in their work and that practitioners engaging in teaching-as-research can consider when restructuring their classrooms as antiracist.

KEY WORDS: *asset-based theories, race, critical race theory*

1. INTRODUCTION

We write in the political moment of early 2021. While engineering education researchers are increasingly engaging with critical race theory and other asset-based or sys-

tem-based theorizing (as described in Mejia et al., 2020), the predominant paradigm continues to rely on deficit-based models to explain engineering education's persistent demographic whiteness and maleness. The groundswell of support for the Black Lives Matter movement during summer 2020 has prompted many white* researchers to (re) confront how racism is baked into institutional structures. We are, once again, faced with the irrefutable: most engineering programs are more white and male than ever (with the notable exception of Historically Black Colleges and Universities [HBCUs] and other institutions dedicated to educating minoritized students). We must mobilize during this political moment to shift the paradigm of diversity, equity, and inclusion research and practice away from the largely insufficient models theorizing about bias and barriers, and toward transformative approaches to reimagining research and practice. At the same time, those of us who are members of majority cultural groups in the U.S. must exercise caution in their use so as not to co-opt new (to us) paradigms into reinforcing logics of dominant narratives.

This paper aims to prompt engineering education researchers and engineering educators to adopt antiracist theories and ideologies in order to reframe engineering education research on race. We describe multiple asset-based theories that interrogate the production and reproduction of demographic marginalization. There is significantly less literature describing and applying asset-based compared to deficit-based approaches within science, technology, engineering, and mathematics (STEM) educational settings, which points to a deficit-minded culture (Martin et al., 2019; Lane et al., 2020). Thus, it is important to examine the use and misuse of asset-based approaches in order to spark more engagement within engineering education research. This paper is not meant to be comprehensive. It is meant to illustrate ideas to encourage and inspire readers to delve more deeply and intentionally into these issues.

Deficit-based models have long focused on the majoritarian narrative by placing the blame on marginalized people rather than on the overarching systems in place that disadvantage them. Deficit thinking and cultural deficit theorizing is centered on a "fix-the-student" mindset (Martin and Garza, 2020; Yosso et al., 2009). Deficit approaches place the blame for low educational achievement and attainment on Black and Indigenous People of Color and Latinx students (Solórzano and Yosso, 2002). Furthermore, this blame is centered on a normalized standard of knowledge set by whiteness (Au, 2016). Asset-based approaches decenter the majoritarian and instead focus on what marginalized students bring into engineering. Asset-based approaches provide evidence for imperative systemic changes in engineering.

Engineering education research has included a wealth of diversity research that investigates race statistically, such as reporting statistical differences between racial groups along particular measures or constructs (Pawley et al., 2018; Zuberi and Bonilla-Silva, 2008). While this research is valuable, the systems of racism in place that produce and reproduce these statistics remain unquestioned. Thus, we write this paper to

*Following the lead of Holly Jr. and Masta (2021), we are intentional in not capitalizing white throughout the paper in an effort to decenter whiteness and white dominance in the U.S.

share insights from our work where we have acknowledged racism as the root cause of engineering's whiteness and adopted asset-based approaches to engineering education research grounded on antiracist theories to reframe our investigations. We present these frameworks primarily in terms of their use in research, while also recognizing that they have implications for teaching. We hope these frameworks encourage engineering researchers and practitioners to make engineering education more inclusive and antiracist.

2. AUTHORS' POSITIONALITIES

The authors of this paper represent a range of diverse experiences and viewpoints. They include a white female PhD student, a white male professor, a Black female associate professor, a Latino male associate professor, a white cis-gender female professor, and a Latina clinical associate professor. The authors have all published on topics related to diversity, equity, and inclusion. All of the authors recognize that racism is entrenched in contemporary U.S. society, that structural racism permeates U.S. culture today as much as historically, and that critical and antideficit theories are needed to interrogate and challenge racist practices and structures.

The authors recognize that racism exists outside of the U.S., and these frameworks could be adapted for application in international contexts. However, given that these frameworks were developed within U.S. contexts and that the authors' experience using them is solely within the U.S., we have chosen to limit our discussion to the U.S.

As part of our commitment to practicing our problematization of conventional power relations, we rejected setting authorship order based on some quantification of direct work on this paper, given that minoritized members of our team have a wealth of embodied expertise and daily work around minoritization that our dominating members do not. At the same time, while authorship order results in some people's contributions being highlighted and recognized more than others, it also makes some people more available for targeted harassment (Pawley et al., 2019). We considered other logical systems, including minoritized status (including race, gender, and sexuality in addition to academic rank and connection to the field), but struggled to reconcile our resisting rank-ordering minoritized statuses with the fact we had to put people in a discrete order. Although we are still dissatisfied with it, we have decided to adopt a logic of alphabetical order by last (family) name. It is important to note that this order in no way indicates the percentage of contribution to the manuscript.

3. DESCRIPTIONS OF FRAMEWORKS

We describe a set of nine frameworks, summarized in Table 1. We begin with racial and vocational identity development, which melds theories of vocational identity such as engineering identity with considerations of race. Next, we share theories informed by critical race theory: color-blind racism, funds of knowledge, the antideficit achievement framework, community cultural wealth, and Nepantla. We then build on the Chicana feminist roots of Nepantla by introducing theories informed by feminist theory: in/au-

TABLE 1: Summary of frameworks. Note that this table is intended as a starting point. Readers interested in one or more of these theories should read the literature extensively and cite additional literature not included in this table

Framework	Foundational source(s)	Original context(s)	Key tenets	Examples of use
Racial and vocational identity development	Helms (1994); Helms and Piper (1994)	Vocational psychology; Racial identity development of Black and white people	Individuals internalize racism in societies in which rewards and punishments are tied to race. Racial group membership is an aspect of one's identity. Identity development occurs through a maturation process in which external definitions of race are replaced by internal definitions. Maturation occurs through increasingly sophisticated ego statuses.	Byars-Winston (2006); Chrobot-Mason (2004); Witherspoon and Speight (2009)
Color-blind racism	Bonilla-Silva (2018); Bonilla-Silva and Forman (2000); Gallagher (2003); Lewis et al. (2000); Reason and Evans (2007)	Ways in which white people and People of Color in the United States experience and understand race and racism	Abstract liberalism; Naturalization; Cultural racism; Minimization of racism.	Pawley et al. (2018); Dietz et al. (2020); Douglas et al. (2019)
Funds of knowledge	Velez-Ibañez and Greenberg (1992); Moll et al. (1992)	Used to describe the existing strategic and cultural resources utilized for survival and well-being primarily by Mexican American families along the southwest U.S.–Mexico border	Communities and households are spaces for knowledge production. Challenge the perceived lower qualifications of Mexican Americans as a result of the “inadequacy” of working-class family households.	González et al. (2005); Smith and Lucena (2016); Wilson-Lopez et al. (2016); Mejia et al. (2019); Sias et al. (2016)

TABLE 1: (continued)

Antideficit achievement framework	Harper (2010)	Black students and other students of Color in STEM	Highlight successes of students of Color rather than deficits. Reframe deficit-oriented research questions into antideficit research questions.	Burrell et al. (2015); Burt et al. (2019); Burt et al. (2018); Newman (2015); Mejia et al. (2018)
Community cultural wealth	Yosso (2005)	Identifies forms of capital possessed by communities of Color	Six forms of capital: aspirational, linguistic, familial, social, navigational, resistant.	Rincón et al. (2020); Rincón and Rodriguez (2020); Ortiz et al. (2019); Revelo and Baber (2018)
Nepantla	Anzaldúa (1987, 2015)	Decolonize the theorizing of Chicanas' experiences living in liminal spaces	Recognize the sociopolitical contexts of physical and symbolic spaces. Identity involves a complexity of lived realities that include languages, values systems, beliefs, class, race, and cultures.	Aguilar-Valdez et al. (2013); Gutiérrez (2012); Mejia et al. (2017)
In/authenticity	Faulkner (2000a,b, 2007, 2009a,b)	Gendered expectations in the engineering workplace	Engineering roles are stereotypically masculine or feminine. Gendered roles can make engineers feel as if they don't belong in the workplace when their identity and gendered role do not match.	Hatmaker (2012); Holth (2014); Olofsdotter and Randevåg (2016); Saavedra et al. (2014); Dietz et al. (2019, 2020, 2021); Douglas et al. (2019)

TABLE 1: (continued)

Framework	Foundational source(s)	Original context(s)	Key tenets	Examples of use
Ruling relations	Smith (1990, 1999, 2005)	Gendered nature of labor	Social relations are organized through institutions to benefit a ruling group. These relations are operationalized through texts. People activate texts using them to do work within the institution.	Jones et al. (2014); Pawley (2019); Santiago et al. (2011)
Racialized organizations	Ray (2019)	Linking structural explanations of race with organizational theory	“Racialized organizations enhance or diminish the agency of racial groups. Racialized organizations legitimize the unequal distribution of resources. Whiteness is a credential. The decoupling of formal rules from organizational practice is often racialized” (Ray, 2019, p. 26)	Stich (2020)

thenticity and ruling relations. We end building the notion of gendered organizations into race and connecting back to CRT with racialized organizations and the history of racist ideas. For each, we describe core elements of the framework, its roots, how it has been used in literature, how scholars have applied it to engineering education research questions and contexts, and some struggles and difficulties in its use. Our selection of these particular theories is idiosyncratic, reflecting the collected interests and expertise of the authors. Additional theories that readers may be interested in exploring are more fundamental readings in CRT (Bell, 1987, 1992; Crenshaw, 1989; Delgado and Stefancic, 2012; Matsuda, 1993; Williams, 1991), including its application to education (Ladson-Billings and Tate, 1995; DeCuir and Dixson, 2004; Valencia and Solórzano, 1997) and its descendants such as LatCrit (Arriola, 1997, 1998; Solórzano and Yosso, 2001; Valdes, 1998; Yosso, 2006), TribalCrit (Brayboy, 2005, 2013), DisCrit (Connor et al., 2016), and critical race feminism (Collins, 2002; Crenshaw, 1989; Davis, 1983; hooks, 1994; Wing, 2003).

What these frameworks share is a commitment to a foundation of moral principles. Color-blind racism, antideficit achievement framework, community cultural wealth, and Nepantla all share a foundation of critical race theory. In our context, that means an explicit rejection of deficit theories to explain the minoritization of People of Color in engineering and engineering education and a commitment to disrupt systems of oppression. Ray's (2019) theory of racialized organizations and Kendi's (2016) articulation of racist ideas share some connections with CRT such as the acknowledgment of race as a social construct and whiteness as property or credential.

Ruling relations theory and in/authenticity theory have their roots in 1980s–90s feminist theory, and like much of the work by white feminists at that time, risks generalizing the experiences of white women as the experiences of all women. However, there seems nothing endemic to the theories necessitating that racist turn, and they share with CRT-informed theories a commitment to structural explanations of the experiences of marginalization.

3.1 Racial and Vocational Identity Development

Racial and vocational identity development connects racial identity theory with theories of vocational development (e.g., developing an engineering identity). It explains the ways in which people react to racial issues that occur in the work environment in relation to their stages of career maturity. Examinations of racial and other identity characteristics are common in the social sciences. Considering racial identity development along with vocational or professional identity development offers a lens for more nuanced understanding of being racialized broadly and within a profession more specifically. Much of the research on vocational, career, or professional identity considers specific competency-related variables, and race, gender, or other identity characteristics are nominally considered – placing people into mutually exclusive groups and essentializing the experiences of all group members as the same – if at all (Helms and Piper, 1994).

These data collection approaches tend to only underscore representation among certain groups rather than exploring why disparities persist. Furthermore, examinations of stage fluidity, inter-group differences, and discipline-specific assumptions are warranted.

Racial identity development in particular has been theorized by a number of scholars (e.g., Cross, 1978; Helms, 1994) seeking understanding about how individual and societal conceptions and responses to race influence individuals and groups, inter- and intra-personally. Helms's (1994) conceptions of racial identity development for People of Color and white people provides a sociopolitical perspective that has been applied to vocational and career assessment and identity. This lens suggests "socialization in a racially oppressed or oppressing racial group is assumed to have differential implications for a person's psychological status and behaviors" (Helms and Piper, 1994, p. 124). Piper (1992 as cited in Helms and Piper, 1994) found a relationship between Black college students' stages of racial identity and career development, which provided rationale for more intentional investigations of racial salience in vocational development. Subsequently, Helms and Piper (1994) offered implications for stages of career maturity (Super, 1984 as cited in Helms and Piper, 1994) and stages of Black and white racial identity development.

Engineering education researchers, over the last two decades, have begun to explore the minoritized statuses of People of Color, women, and women of Color in particular (Ong et al., 2011; Camacho and Lord, 2013; Moore III et al., 2003; Tate and Linn, 2005). Following the lead of science education scholars, more recent inquiry has addressed congruence between racial identity and engineering identity and implications for engineering programs and workplaces (Berhane et al., 2020; Dietz et al., 2019; Ireland et al., 2018; Morton et al., 2019). Engineering is widely recognized as a masculine, white, heteronormative discipline (Tonso, 2014). Thus, developing an engineering identity is often incongruent with individuals with other identity markers (Dietz et al., 2021; Revelo Alonso, 2015). Research has shown that People of Color in engineering programs and workplaces have few socioculturally similar role models or peers to promote a sense of belonging, professional identity development, and persistence in the program and field (Dietz et al., 2021). Those who are successful establish, integrate, and negotiate multiple identities (e.g., social, professional; [Dietz et al., 2020, 2021; Ross et al., 2017, 2021]) and manage stereotypes ascribed to marginalized groups to which they are perceived to belong (McGee, 2016; McGee and Martin, 2011).

Research in this area illuminates the agency-structure dialectic (Ross et al., 2021) that can inform individual behaviors and structural change. However, the structural and institutional changes that are needed to improve representation and provide a more expansive conception of engineering identity requires transformation of education and workplace environments by the individuals with the power to instigate change. Examining engineering identity/ies can easily default to a juxtaposition between the stereotypical perceptions of engineers (i.e., white, heteronormative, male) and any other individual or integrated identity characteristics. Simplistic or nominal uses of identity framing leave dominant and minoritized statuses intact.

3.2 Color-Blind Racism

Scholars of race and sociology continue to expose color-blind racism[†] and its pervasive use as a tool for defending systemic white privilege (Bonilla-Silva and Forman, 2000; Gallagher, 2003; Lewis et al., 2000; Reason and Evans, 2007). Bonilla-Silva and his colleagues (see Bobo, 2004; Forman, 2004) have theorized and empirically studied the ways white people and People of Color in the United States experience and understand race and racism. Color-blind racism, as characterized by Bonilla-Silva, manifests in four primary frames: *abstract liberalism*, *naturalization*, *cultural racism*, and *minimization of racism*. *Abstract liberalism*, which he considers foundational to this ideology, allows its users to tout liberal economic and political views such as equal opportunity, choice, and merit. Any arguments that include the realities of past and present inequities are discursively shifted to abstraction and disconnection. *Naturalization* builds on the abstract liberalism notion of individual choice. In this vein, human nature leads to *de facto* segregation, and any privileges afforded to white people naturally occur because of socialization rather than subordination. *Cultural racism* focuses on how the “natural” subordination of Black and other People of Color is attributed to culturally-based arguments, in effect dismissing structural and systemic discrimination. Finally, *minimization* describes how, when issues of discrimination are raised by minoritized people, the color-blind perspective affords the denial of racialized inequities as historical or misattributed individual acts.

Researchers have empirically applied these frames with participants of different age groups. Interestingly—but not surprisingly—as a group, white participants’ survey responses were inconsistent with what they disclosed in interviews. Bonilla-Silva and Forman (2000) surveyed and documented the “race talk” of white college students and found that they had great difficulty seeing themselves as racialized and employed many of the semantic moves that are consistent with color-blind racism (e.g., “I am not a racist, but...”). Bonilla-Silva (2003, 2018) found that older white participants who lived pre- and post-civil rights era reflected similar beliefs to their younger counterparts but were much more likely to be straightforward in their responses (e.g., every race sticks together).

Engineering education researchers are increasingly taking up racialized frameworks, including color-blind racism, as a way to interrogate the overwhelming whiteness in engineering (Mejia et al., 2020). Pawley et al. (2018) employed Bonilla-Silva’s theory of color-blind racism to explore how engineering education as a context reproduces and reinforces its culture throughout the K-20 educational enterprise for both researchers and instructors. Efforts to redress the problem in engineering education programs is often met with resistance from the majority white faculty and students and subsequently increases vulnerability for the faculty of Color and women who invest their time and intellectual energy in this work (Chen et al., 2019). Because the culture of engineer-

[†] While we use “color-blind racism” as coined and used extensively, we also recognize the ableist naming and that DisCrit scholars offer color-evasiveness as more expansive and accurate (Annamma et al., 2016).

ing education is built and reinforced by purportedly color-blind values, white engineers continue to perpetuate these perspectives and related behaviors in the workplace (Dietz et al., 2019; Douglas et al., 2019). In an interview study, Douglas and colleagues (2019) found that white engineers expressed their belief in equal opportunity and minimized the salience of race and other forms of discrimination in the workplace as playing a role in the relative homogeneity of the field.

Color-blind racism is a sociological heuristic that could be inappropriately reduced to examining an individual's perceptions about race rather than how contexts reinforce or disrupt marginalization. Researchers choosing to employ this framework must carefully consider the questions posed as well as the participants and contexts under study. As this framework gains traction, scholars must stay vigilant in identifying how the various frames are used interchangeably—or in tandem—by differently positioned individuals.

3.3 Funds of Knowledge

The concept of funds of knowledge was initially used to describe the existing strategic and cultural resources utilized for survival and well-being primarily by Mexican American families along the U.S.–Mexico border (Velez-Ibañez and Greenberg, 1992). This work was then adapted to educational contexts, where Luis Moll and colleagues (1992) sought to challenge the idea that households were inadequate at preparing students for school or providing children with the tools to succeed in school (González et al., 2005). Funds of knowledge research sought to frame and present Mexican American households as rich sources of knowledge, skills, and practices that transcended the home and were embedded in social practices. Researchers have argued that this approach to conducting research (and teaching and learning) is important in order to engage more students in STEM (Barton and Tan, 2009; Rios-Aguilar et al., 2011; Wilson-Lopez et al., 2016).

It is important to emphasize that the initial goal of funds of knowledge research was to encourage teachers to learn more about the wealth of knowledge of students emerging from the home (González et al., 2011). The ethnographic nature of this work encouraged teachers to interrogate the power dynamics that exist in educational systems, the types of knowledge that are valued, and to make community epistemologies visible (González et al., 2005; Secules and Mejia, 2021). In addition, a funds of knowledge approach sought to dismantle deficit thinking in classrooms and among teachers to provide a different context to how demand, productivity, and efficiency are conceptualized in classrooms and in American society in general (Secules and Mejia, 2021). That is, to challenge the framing of education in capitalist terms where only certain types of production are valued. Providing a counternarrative to the discourse of who produces knowledge and how knowledge is produced placed Latino/a/x students, their households, and communities as legitimate holders and creators of knowledge (Delgado Bernal, 2002).

A number of authors in engineering education have adopted funds of knowledge approaches for research on minoritized students (Smith and Lucena, 2016; Wilson-

Lopez et al., 2016) and as a pedagogical approach (Mejia et al., 2019; Sias et al., 2016). Wilson-Lopez et al. (2016) analyzed the funds of knowledge of Latinx adolescents as they worked on providing solutions to community-based engineering design challenges. In this study, different engineering-related activities were aligned with funds of knowledge in an effort to demonstrate how this wealth of knowledge translated into engineering knowledge, skills, and dispositions. The study also highlighted the importance of acknowledging these ways of knowing, doing, and being to promote more culturally responsive engineering education. In terms of pedagogical approaches, Mejia et al. (2019) provided training on funds of knowledge to summer camp facilitators to help them recognize, elicit, and validate funds of knowledge as the students engaged in STEM activities. The summer camp facilitators recognized the value of funds of knowledge in engaging students and helping them see themselves reflected in the STEM activities. However, the summer camp facilitators recognized that finding points of connection is difficult, and a robust funds of knowledge approach would require more time to reflect on the ways in which STEM relates to everyday life practices.

Although the use of this framework in engineering education has increased, most of the research has been more predominant at the K–12 level (Denton and Borrego, 2021; Secules and Mejia, 2021). One of the challenges in engineering education is that a funds of knowledge approach has not been intentionally made to fit into a traditional engineering curriculum where content, language, culture, and context are often seen as separate entities (Secules and Mejia, 2021). As indicated by Mejia et al. (2019), this compartmentalization occurs because educators tend to situate themselves within the dominant STEM curriculum, which is mostly taught from a white, Eurocentric perspective; there are limited opportunities to connect the content to other ways of knowing and doing. Adapting a funds of knowledge approach would require a process of decolonizing the curriculum, where instructors are actively engaged and critically analyzing how to draw from students' wealth of knowledge without essentializing culture, and students are recognized as owners and creators of knowledge rather than blank slates (Secules and Mejia, 2021).

A common factor that impinges on the validation and acknowledgment of funds of knowledge is deficit thinking among instructors and their blaming underachievement of students of Color on perceived deficiencies due to their background (Hogg, 2011; Llopart and Esteban-Guitart, 2018). Deficit thinking creates an expectation of low achievement because of perceived inadequate language proficiency, motivation, or lack of familial support. Engineering education research that seeks to bring funds of knowledge as a framework also needs to consider professional development that challenges and disrupts deficit thinking in the classroom. It is important to remember that the work of funds of knowledge was primarily qualitative and did not seek to create hierarchies of knowledge (Secules and Mejia, 2021). Although some research in engineering education has sought to quantify funds of knowledge through instruments, researchers must be cautious and reflect on the long-lasting effect of work that could undermine the intent of this framework.

Funds of knowledge recognizes that culture is not static; therefore the wealth of knowledge, skills, and practices of individuals are not bounded to a particular perceived culture. Not all Latinos, for example, will carry the same funds of knowledge. While there may be some similarities based on cultural archetypes and dimensions (Hammond, 2016), funds of knowledge theory highlights the plurality that exists among communities rather than essentializing or simplifying cultural characteristics.

Funds of knowledge, just like Nepantla and community cultural wealth (see below), seeks to highlight the knowledges that exist in the community and to challenge the idea that communities of Color have inherent inadequacies. These frameworks, in essence, are intended to amplify the voices of those who have been silenced through oppression.

3.4 Antideficit Achievement Framework

Harper (2010) developed an achievement framework based on other frameworks and theories in sociology, psychology, and education to highlight the success of STEM students instead of deficits. As Harper describes, this framework takes on an “instead of” approach: “that is, instead of relying on existing theories and conceptual models to repeatedly examine deficits, researchers using this framework should deliberately attempt to discover how some students of Color have managed to succeed in STEM” (p. 68). The framework was explicitly developed within a study of Black STEM students and for students of Color in STEM. In this framework, Harper reframes deficit-oriented research questions into antideficit research questions and presents areas of research for understanding student success from an antideficit perspective. These research areas are distinguished by pre-college, college, and post-college pathway points and include specific areas for each pathway point. For the pre-college pathway point, these areas are familial factors, K–12 school forces, and out-of-school college prep experiences. For the college pathway point, they are classroom interactions, out-of-class engagement, and experiential/external opportunities. And, for the post-college persistence pathway point, they are industry careers, graduate school enrollment, and research careers. For each of these areas, Harper provided questions for framing research using an antideficit perspective.

Researchers have used Harper’s framework as a way to reconceptualize research design and research questions by focusing on success rather than deficits (Burrell et al., 2015; Burt et al., 2018, 2019) by following the framework in asking *how* and *what* questions rather than *why* questions when doing research about minoritized students in STEM. Harper argues that why questions maintain a focus on deficit perspectives of students (e.g., Why do engineering students of Color leave the major?) instead of focusing on success and achievement (e.g., What enables engineering students of Color to persist in the major?). Harper argues that majority research has focused on why questions, which lead to stories about student deficits and departure and, as a result, stories of student success and persistence are understudied.

Newman (2015) used Harper’s framework in conjunction with another framework to study the success of African American engineering students. From this work, Newman shares success stories of African American students who were mentored and guided

by faculty from a different racial background. Newman concluded that engineering faculty culture needs to be interrupted, and all faculty, not just faculty of Color, need to support students of Color in their educational pursuits. Mejia and colleagues (2018) applied the antideficit achievement perspective in their development of a liberative approach to scholarship in engineering education. Driven by an antideficit perspective, the authors focused their literature review and research questions on scholarship that intended to highlight students' assets. Many of these works used critical theoretical frameworks; unfortunately, the authors found it was common for engineering education researchers to misuse critical theoretical frameworks such as those discussed in this paper.

Harper's framework lends itself to be an entrance point of reflection and reference for researchers who aim to reassess their work by using an asset-based approach. Given that this framework is broad and encompasses other educational frameworks in higher education, authors should be cautious not to use antideficit frameworks or approaches in a superficial manner. Deficit approaches presume something is lacking in individuals, instead of interrogating the structures that lead to differential achievement or understanding the unique resources People of Color possess (see next section on community cultural wealth). Even when using an antideficit approach as a motivation for research as a starting point, doing so is not an in-depth use of the framework. In-depth use is indicative of its components and nuance such as embedding the framework throughout the research plan.

3.5 Community Cultural Wealth

Yosso's (2005) community cultural wealth (CCW) framework has had a surge of use in the engineering education research community in the last five years. Community cultural wealth was developed with People of Color in mind, given it was derived from critical race theory. Applied to higher education, the CCW framework enables scholars to view, understand, investigate, and appreciate students of Color by emphasizing their assets—their cultural wealth. Moreover, the CCW framework purposefully shifts the narrative from deficit scholarship to asset-based scholarship. CCW challenges traditional interpretations of cultural capital by demonstrating other types of wealth (or, capital) that communities of Color possess. The six forms of capital demonstrated in CCW are aspirational, linguistic, familial, social, navigational, and resistant capital. These are summarized below, using direct quotations from Yosso's (2005) article:

- *Aspirational capital* “refers to the ability to maintain hopes and dreams for the future, even in the face of real and perceived barriers” (p. 78). In engineering education, barriers can take the form of weed-out courses, discouraging professors, incompatible transfer policies, or inflexibility in the curriculum.
- *Linguistic capital* “includes the intellectual and social skills attained through communication experiences in more than one language and/or style” (p. 78). In engineering education, linguistic capital possessed by students of color may be repressed by “professional development” messaging where students are enculturated into thinking that engineers must act, talk, and communicate in narrowly

specific ways, discounting other ways (and languages) that students may develop professionally as engineers.

- *Familial capital* “refers to those cultural knowledges nurtured among *familia* (kin) that carry a sense of community history, memory, and cultural institution” (p. 79). In engineering education, students may find spaces where familial-like environments are celebrated, such as ethnic student organizations and inclusion-driven student affairs units. However, more often than not, these spaces are counterspaces—in other words, they are not necessarily embedded within the larger culture of engineering.
- *Social capital* “can be understood as networks of people and community resources” (p. 79). Such networks for engineering students may extend beyond traditional networks (e.g., engineering peers, engineering mentors) and include family and community in providing “instrumental and emotional support” (p. 79) to navigate engineering education.
- *Navigational capital* “refers to skills of maneuvering through social institutions” (p. 80). Historically in the United States, higher education institutions have not been built with communities of Color in mind; as a result, students of Color have to navigate processes, barriers, or policies that may not be in place for other students.
- *Resistant capital* “refers to those knowledges and skills fostered through oppositional behavior that challenges inequality” (p. 80). As discussed in Revelo and Baber (2018), in engineering, “students of Color actively resist norms by embracing collectivist perspectives and engaging in amplified acts against norms that negatively shape their experiences” (p. 254).

Here we share selected examples of research that used CCW in engineering that have highlighted students’ assets and institutional opportunity for larger change. Rincón et al. (2020), in their study of STEM first-generation and continuing-generation students, reported that students who made use of CCW forms of capital experienced incongruence with institutional expectations and values and thus made use of their resistant capital to navigate this incongruence. The authors conclude, “Thus, by co-opting and decoupling CCW from its original intention of centering communities, institutions further perpetuated individualistic ideals and sustained meritocratic reward systems” (p. 850). Rincón and Rodriguez (2020) used CCW to connect Latinx students’ use of CCW forms of capital to their STEM identity, and they reported that students activate and use at least six forms of capital. Similarly, in their research about Black postsecondary students in STEM, Ortiz et al. (2019) conclude, “it is intuitive that these forms of capital be recognized, valued, and adopted by all constituents who work with Black learners, exposing the way in which their Black experience is part of their continued STEM success.” Revelo and Baber (2018) used CCW to integrate engineering identity formation with culture in their study of Latinx engineering undergraduates. To expand upon the conceptualization of engineering identity, they found additional engineering identity dimensions that

were culturally situated and critical to students' development. These works that have used CCW highlight the importance of using the framework not just to recognize and highlight students' forms of capital but also to examine the institutional responsibility in doing so.

Like some of the other frameworks discussed in this paper, community cultural wealth has roots in CRT; as a result, one of the mishaps of using this framework (and others with the same roots) is in using it without challenging racism. As Yosso (2005) explains, the forms of capital in CCW are not mutually exclusive and can overlap or build on one another. Authors should avoid superficially separating forms of capital, especially where clear overlap is shown to exist and using CCW to highlight individual exceptionalism rather than the individual as part of a rich community.

3.6 Nepantla

Nepantla is a Nahuatl word that alludes to the in-between space in which clashes, changes, and liminality take place (Anzaldúa, 2015). Anzaldúa used the term Nepantla as the backbone to describe her Borderlands theory and process (Anzaldúa, 1987) that was later adopted by Chicana feminist scholars to highlight the complexities of the lived experiences of minoritized groups—primarily Chicanas/os/xs. According to Anzaldúa (2015), individuals that live in between spaces—whether physical or not—have to struggle with conflicting worldviews. For instance, for Chicanos living along the U.S.–Mexico border, this in-betweenness means engaging with different identities, languages, value systems, beliefs, cultures, and the always-present oppression. One is not placed in Nepantla by choice but is abruptly thrown into a vortex of different realities (Anzaldúa, 2015). Individuals in Nepantla experience conflict, unruly emotions, and isolation, yet it is also a place where empowerment, agency and a new sense of self can be uncovered. In addition, Nepantla is a framework that seeks to engage others in conversations of decolonization.

Nepantla has been used by different scholars to explore issues related to teacher education (Gutiérrez, 2012; Prieto and Villenas, 2012; Venegas-Weber, 2018), science and mathematics education (Aguilar-Valdez et al., 2013; Gutiérrez, 2008, 2012), bilingual education and literacy (Lizárraga and Gutiérrez, 2018; Reyes McGovern, 2020; Valdez-Gainer and Gainer, 2019), and social justice (De Los Santos Upton, 2019; Elenes, 2014). Aguilar-Valdez and colleagues (2013) and Gutiérrez (2012) described how science and mathematics education can draw from Nepantla to dismantle dominant scientific discourse that continues to perpetuate assimilationist practices in classrooms. They argue that the current system, which emphasizes a Westernized perspective on science, disregards any contributions made by communities of Color, thus resulting in the marginalization of culture and language in STEM spaces. To counter this oppressive system, Gutiérrez (2012) argues for a recognition of different ways of knowing, doing, and being, and to allow students in Nepantla to embrace their lived realities—and their corresponding uncertainties—to heighten awareness of their surroundings and to generate new knowledge.

It is this critical awareness that is needed in engineering as more individuals advocate for a sociotechnical and holistic approach to engineering education. Research in engineering that draws from the framework of Nepantla is still limited. Mejia et al. (2017) offer one of the few studies where the framework of Nepantla was used to describe and highlight how Latino students engage in engineering design. Their analysis indicated that living in a complexity of lived realities allowed the youth to address engineering problems in their community through a different approach—one that was informed by a critical and intimate connection to the world around them and a collectivist culture where they envisioned how to grow together. This perspective challenges the competitive and meritocratic ideology prevalent in engineering (Cech, 2013). Moreover, Nepantla contributes to an analysis that is not prescriptive and provides the tools to question what is thought to be static, homogeneous, and normative. Nepantla moves us a step closer to dismantling the notion of the Latino monolith (Revelo et al., 2017) and embracing the tensions of many engineering students and the multiple perspectives that occupy this space of simultaneous clashes.

Thus, instead of abiding by a prescribed list of restricted engineering ways of knowing, engineering educators are encouraged to consider the learning that can be achieved through an agenda that promotes the examination of border knowledges and experiences. By cultivating a Nepantla approach to engineering education, and allowing the space for students to embrace Nepantla, researchers will promote the creative learning that can occur in this unique space and in a culturally relevant manner.

3.7 In/Authenticity

The theory of in/authenticity was developed by Wendy Faulkner to describe gender roles in engineering workplaces (Faulkner, 2000a,b, 2007, 2009a,b). The term “gender inauthenticity” was first coined in the context of software engineering to describe the engineering dualities that occurred (Faulkner, 2000a,b). Faulkner developed her theory based on the experiences of her participants and her observations made in the workplace. She described these engineering settings as bifurcated technical and social realms, where the technical served as “real” engineering for the workplaces she studied. Stemming from gender stereotypes, men are expected to engage in the material world, while women are expected to engage with the social world. Thus, she used this duality to explain why some women reject computer science as “nerdy” or too technical and lacking engagement with the social world. The theory explains how a woman doing stereotypically masculine work may feel inauthentic in her role due to gender expectations. Faulkner (2007, 2009a,b) later expanded her concept of inauthenticity to describe how certain engineering roles are stereotypically masculine (e.g., technical work) and others are stereotypically feminine (e.g., personal interactions). Throughout multiple engineering firms, she found that for both men and women, interactions were gendered and led some engineers to feel as though they didn’t belong. Gendered examples included topics of conversation, humor, and social networks (Faulkner, 2009a).

In/authenticity has been used in the literature to understand the experiences of women in male-dominated engineering cultures (see for example Hatmaker, 2012; Holth, 2014; Olofsdotter and Randevåg, 2016; Saavedra et al., 2014). This concept has also been used to understand the experiences of women in undergraduate engineering programs (see, for example, Blosser, 2017; Cech et al., 2011). In research undertaken by Dietz, Douglas, and McCray, the concept of in/authenticity was expanded to include race, which, to our knowledge, has not been examined in engineering education research (Dietz et al., 2019, 2020, 2021; Douglas et al., 2019).

The addition of race to the concept of in/authenticity has been used to identify instances of racially “inauthentic” experiences due to cultural mismatch, or biculturalism (Bell, 1990), in the workplace. Faulkner (2009a) alluded to this adaptation, stating “...bonding between women and men within engineering may be less automatic than between men and men, and that women engineers have to work harder to achieve the same level of easy acceptance with new associates. I saw hints of a similar phenomenon operating along race and ethnicity lines also” (p. 6). She framed in/authenticity to depict “the normative pressures of the way things are” (Faulkner, 2009b, p.173), which exposes the beliefs we hold that were formed through social constructions. Recently, Dietz et al. (2019, 2020, 2021) and Douglas et al. (2019) have applied in/authenticity to race in exploration of the experiences of Black engineers in the computer and information technology industry as well as described its use as a critical framework (Dietz et al., 2019). Furthermore, the use of in/authenticity allows insight into the experiences of gender nonconforming (GNC) and transgender people within engineering workplaces that have gendered cultures and stereotypical roles based on assumed biological gender. For example, Dietz et al. (2021) applied in/authenticity to understand the experiences of a transgender woman in tech.

When using in/authenticity, one complication within workplace settings has been the distinction between someone acting inauthentically or acting authentically through professionalism. The standards of professionalism have been established through white supremacy by centering whiteness (Gray, 2019). Cautions and considerations while understanding the experiences of inauthenticity versus professionalism are: How is professionalism defined within the workplace? What cultural elements are included or excluded? It is crucial to look beyond normative definitions and understand how they were written by the dominant for the dominant.

3.8 Ruling Relations

Feminist sociologist Dorothy Smith theorized the concept of ruling relations in her writings (Smith, 1990, 1999, 2005), developed out of standpoint theory. She and other feminist scholars wrote about inadequacies around the then contemporary sociological theory that focused on paid labor, arguing how reproductive labor—generally unpaid labor that people invest in caring for family members and maintaining households—was absent from mainstream theory. She framed the concept of “everyday/everynight” to draw attention to how labor was not limited to a paid workday (Smith, 1999). To understand the

gendered nature of everyday/everynight labor, she investigated the role of institutions—like health care, in contrast with specific organizations like a particular health clinic—in producing seemingly neutral policy that produced unjust power relations in their implementation. She introduced the methodology of institutional ethnography, which used ethnographic methods to understand the structure of institutions writ large and how they were coordinated across time and geography (Smith, 2005). This theorizing provided significant extension from more mainstream feminist theory on standpoint and aligns with the structural focus provided by other frameworks we have offered in this paper.

Smith described her theory of ruling relations beginning with the idea that social relations are organized through institutions (e.g., health care, higher education) in the interests of a ruling group. Ruling relations are operationalized through texts that coordinate relations translocally across specific organizations within an institution. Within organizations, people as individual actors must “take up” those texts in order to activate them to do their work. For example, a new policy about promotion and tenure during the COVID-19 pandemic doesn’t itself do work; candidates must build their cases based on its guidance, department heads must build it into the request for refereed letters, promotion and tenure committees must build it into their process of judging dossiers, and so on. Through these acts, the texts do work—in other words, texts don’t do work on their own, people must use them for them to do work. Those people then are doing work through texts that organize social relations on behalf of a ruling group and which could be counter to their own interests. The method of institutional ethnography is designed to interrogate ruling relations by defining a problematic (the conceptual object of interrogation), interviewing actors operating inside the problematic, reviewing texts (whether formal policies, standard operating procedures, technological systems which collect data on behalf of the system and actors, *ad hoc* documents actors make themselves to remember their work, or other documentation) that coordinate social relations across an institution, and arranging them into an explicated narrative that shows how actors complete work within the institution in ways that may be counter to their own well-being.

In engineering education, ruling relations theory has been used in limited ways to understand how the academic practice of engineering education continues to successfully reproduce the demography of its population as overwhelmingly white and male. Pawley and colleagues have used ruling relations to explore how parental leave policies operate to organize the work lives of STEM faculty members who are women, how promotion and tenure policies operate to preserve STEM’s disproportionately male population, how logics governing various aspects of undergraduate engineering education are coordinated to normalize the lived realities of many white, male, 18–22-year-old engineering students, and to build friction for those students whose shapes of lives differ from that norm (Jones et al., 2014; Pawley, 2019; Santiago et al., 2011). The theory seems well placed for the intersectional turn in engineering education equity research, given its locus at the lived experience of individuals. Challenges doing this work include identifying peer reviewers who can speak to the theoretical framing and give the authors new insights, and engineering education colleagues who are interested in collaborating on such projects.

We consider three key difficulties. First, it is seductive to overlook that texts—actual written documents—are core to the interrogation of how social relations are organized in institutions and revert to the tendency to presume actors are acting independently and autonomously. But how texts coordinate activation by actors is core to the theory. Second, researchers must note that organizations and institutions are distinctly different, and the method speaks to institutions broadly—so, higher education, rather than just one’s university. Finally, and most relevant to this paper, it appears that few scholars have tried to think about racialization in addition to the gendered organization that forms the theory’s roots. One, however, is introduced in the next section.

3.9 Racialized Organizations and the History of Racist Ideas

Recently, Ray (2019) brought forth a theory of racialized organizations. He described racialized organizations as “constituting and constituted by racial processes that may shape both the policies of the racial state and individual prejudice” (p. 27). Ray explained the development of racialized organizations as occurring through the control of material and social resources. When these resources become connected to racial schemas (“a kind of unwritten rulebook explaining how to write rules” [p.31]), they become “durable structures.” Thus, Ray’s description of how resources are used to maintain dominant racial narratives is similar to Smith’s (1999, 2005) description of how texts (e.g., policies) are used to maintain dominant gendered narratives.

Kendi (2016) demonstrated this relationship between resources and racialized practices as key to the development of racist ideas throughout U.S. history. Racist policies are not implemented because people have racist ideas. Racist policies are implemented when people have a desire to maintain their dominant status, and the policies are then justified through racist ideas. For example, Kendi described how the racist policies enacted post-Reconstruction were rooted in economic concerns.

Ray’s paper has been cited numerous times in the short time since publication, although only a few authors have made it a central aspect of their analysis or interpretation. For example, Miller et al.’s (2021) study of the status of HBCUs relative to historically white institutions and Stewart’s (2020) research on parents’ school choice decisions for their children used Ray (2019) as an overall framing for their work but did not engage directly with his theory. In contrast, Stich’s (2020) examination of a university’s admission practices, which led to tracking based on race, utilized Ray (2019) as a central argument. As a historical analysis, Kendi (2016) has not been used as a framework to guide research outside of the work of Dietz et al. (2019, 2020). They adopted Kendi’s (2016) work as a framework for research on the experiences of Black engineers in the computer and information technology industry. In one of their examples, “Ben,” a Black male engineer, was reported for listening to music at work, even though he used high-quality headphones, while one of his white coworkers regularly played games on his phone at work and was not reported (Dietz et al., forthcoming). In this incident we see both the disadvantage created for Ben through racial schemas and the pressure on him to assimilate to normative standards of behavior.

Ray's (2019) theory of racialized organizations and Kendi's (2016) description of racist ideas have not been widely used as frameworks guiding research studies. There are thus no examples of their misuse. Rather than misuse, the issue in engineering education is the relative lack of research that examines structural aspects of racism. Work in engineering education has focused on the lack of representation of People of Color, barriers they face (including structural barriers), and assets they use to overcome barriers. Studies that examine the ways that organizations (e.g., universities) and institutions have been built around control of resources and racist ideas are largely missing. (For notable exceptions, see Slaton [2010] and Pawley [2019].) The opportunity is present to use Ray (2019) and Kendi (2016) in engineering education in productive ways that reveal the organizational structures that perpetuate racism.

4. DISCUSSION

4.1 Application in Research

These frameworks bring with them a reminder to include all aspects of the theory—not just the convenient ones or the familiar ones. More engineering education researchers may be resonating toward calls for intersectional research, for example, but without deep reading in theory outside of engineering education research, they may be seduced into thinking that intersectionality theory is merely thinking about race and gender together and overlooking intersectionality's moral and political commitment to explaining how Black women in particular never receive justice. As another example, from our perspective, one shouldn't isolate one form of capital as superficially separated from the others and then say the research is based in community cultural wealth; similarly, one shouldn't apply funds of knowledge to contexts divorced from the cultural/racial contexts of home life or use the theory to develop a hierarchy of knowledge when it was designed as an antideficit theory. We urge researchers to stay true to the tenets of the theory they are using. Losing this anchor at best dilutes the results and at worst (mis)appropriates what are intended to be emancipatory theories and instead bends them to reifying dominant narratives, such as other deficit-oriented theories.

We have also found it important to incorporate the theoretical framing that the theories we have described bring throughout the research design and not just apply it to the analytical step. The theories influence the research questions we ask, the people we talk with and how we talk with them, and the data we collect, all before we get to the analysis of those data (Mejia et al., 2018). Applying, for example, intersectionality theory to existing quantitative analyses where the data were previously collected to support other theoretical purposes is on its face problematic and needs to be carefully and conscientiously handled. Such work should strive for extensive acknowledgment of these risks and choices and explication of how the analysts have grappled with the variable framing throughout their work.

Finally, we included the nine specific theoretical frameworks because they challenge existing prevalent approaches to understanding race in engineering education. However, each one stems from theoretical expertise on race from outside engineering education. In some of our cases, we have adopted theories that seemed to explain engineering education's racial paradigm better than those theories we were seeing inside engineering education research. But, in other cases, we intentionally sought out theories to counteract problematic trends we were seeing in engineering education, including the persistence and indeed growth of deficit-oriented theories. We urge our colleagues to resist using these emancipatory theories to reinforce dominant narratives of domination, so to speak.

We provide four final pieces of advice for moving forward:

1. Read, read, and then read some more. To use any framework, it is necessary to read extensively to understand its roots, its fundamental concepts, and the contexts in which we may appropriately use it. Across education generally, and STEM education specifically, we have seen many instances of theories being misused and misappropriated, perhaps in part because some researchers who use these theories are not sufficiently familiar with them. One can get only an incomplete understanding by reading one author's interpretation or use of a theory in a given context. We urge readers to read widely, going back to the original publications and following the development and use of that theory in later publications. Readers should not rely on any single source, including this paper, to understand the theories.
2. Once you identify an appropriate theory, be sure to integrate it across the research design. Theories should inform study conception, data collection (e.g., survey questions, interview protocol, etc.), data analysis, and interpretation, but also pedagogy. Reviewers often advise researchers to incorporate more theory into their papers and grant proposals. As reviewers, we have seen plenty of instances in which a theory is mentioned, presumably because the authors feel they are "supposed to," but it remains an underdeveloped part of the research design.
3. Use these theories as a means to provide explanatory power to your study. A tendency, particularly in qualitative research, seems to be to code data and present findings that are purely descriptive rather than interpretive. The practice of coding has been criticized as a reductionist approach to analysis that results in "extended, superficial descriptions or stories in which the 'data speak for themselves'" (St. Pierre and Jackson, 2014, p. 716). Instead, analyzing through the lens of theory allows one to interpret what is behind the words of the participants, resulting in a deeper understanding than could be accomplished by simply listing themes.
4. Honor and amplify the work of scholars of Color that have been historically unrecognized for their scholarship. Practicing antiracist approaches to research also includes valuing, respecting, and honoring the work that has been done, and continues to be done, by scholars of Color in engineering education.

4.2 Application in the Classroom

This paper has explicitly focused on research applications. However, many of these principles can be applied to pedagogical rather than interrogative purposes; to do so, one must begin by thinking outside the bounds of one's own classroom. As in applying the frameworks to research, we must apply our moral commitment to antideficit theories and structural explanations of oppression to every aspect of education, from admission criteria to tuition levels and financial aid obligations; to housing accessibility, availability, and expense; to the selection, arrangement, and availability of required courses; to the hidden curriculum built into programs (Jackson, 1968; Anyon, 1980; Villanueva et al., 2018); and to the content that hierarchically orders knowledge as valuable or worthless. Simply, we must examine and redress all activities and processes coordinated by texts and activated by institutional actors in the interests of a ruling class other than those working inside the institution. We must think beyond the individual-accomplishment focus of our own course designs and beyond "accommodating" students or colleagues outside our presumption of norms. Instead, we might think about how our "business as usual" hierarchically organizes knowledge to devalue the knowledge that minoritized students learn in their homes or produces a culture where students learn they must not be their authentic selves, as those authentic selves are framed as antithetical to possible engineering selves. Those of us who identify as white need to do our own work to understand how whiteness, as operationalized in the United States, has incorporated itself as "normal" into institutional norms and cultural expectations and challenge ourselves to problematize them in our own teaching. Pedagogy involves not just teaching but also analyzing the methods, strategies, and practices used in teaching. As engineering education researchers continue to draw from these critical theories, it is important for researchers and educators to critically reflect on how our approach to research and teaching prevents us from decentering ourselves and our pedagogy from whiteness.

Organized by the guiding principles above, we offer the following questions that instructors and administrators who are new to these ideas, and who may also be operating from a dominant racialized position, could consider when looking to learn from the theories presented to move toward an antiracist pedagogy, curriculum, and educational design:

- *Explicitly reject deficit-oriented thinking* – How are you challenging logics of meritocracy in your course design and day-to-day pedagogy, but also in larger scale organizational decisions such as your major's scholarship award practices and programmatic curricular design?
- *Challenge systems of oppression* – How are you learning about the hidden curriculum of valuable knowledge and ways of being that have been baked into syllabi, programmatic design, institutional resource availability, student codes, grievance practices, or institutional equity policy? How are you actively rejecting deficit models when they are offered as institutional "outs" and holding yourself and those who are more powerful than you to a stronger expectation of support?

- *Bring structural explanations* – How are you explicitly educating yourself and your students about racial oppression as being part of the culture of engineering?
- *Include all aspects of theory throughout the design* – How are you influencing educational policy to be more antiracist, from your classroom responsibilities up through the university bylaws, through systems of shared governance and your faculty representatives to ones that remain less democratic?
- *Incorporate theoretical expertise on race outside engineering education* – How have you strived to learn from scholars who have written extensively about bringing antiracist commitments to the classroom outside of engineering education, including K–12 contexts, (hooks, 1994; Ladson-Billings, 2014; Brown, 2019; Madkins et al., 2020) and then adapted them to your context? How have you learned about course design, course content, and pedagogy from scholars and colleagues teaching ethnic studies courses or other courses that support minoritized scholars?

5. CONCLUSION

With this paper, we call for increased thoughtful use of race theories in engineering education research. These theories provide a way to reframe our work from a deficit-based to an asset-based approach and to interrogate the organizational and institutional resources and practices that reify racialized (and gendered) structures. But doing so requires a kind of humility to recognize that none of us, including the authors of this paper, can claim to fully understand any of these frameworks. We have used these frameworks in our own research, but we fully recognize that we may have misinterpretations due to inadequate understanding, attempts to stretch these theories beyond their original intention, or lack of adequate knowledge.

We end by sharing words from Native author Thomas King (2005), who ended his stories with variations along the lines of “take this [...] story, for instance. It’s yours. Do with it what you will. Tell it to friends. Turn it into a television movie. Forget it. But don’t say, in the years to come, you would have lived your life differently if you had heard this story. You’ve heard it now” (p. 29). So, to you, Reader, we ask this question: Now that you have read this article and know more than you did before reading it, what will you do with it?

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