# Critical Theories for Unmasking Individual and Structural Racialized Experiences within Engineering

**Abstract**

This theory paper continues an ongoing conversation about the use of critical theories to examine race in engineering. Critical race theory was popularized in the 1980s for its use in legal studies [1] – and a decade later in education. Although three decades have passed since this movement of race research ignited, the engineering profession still lacks diversity. Whites are still the majority within engineering, which in turn culturally defines the field. In this setting, one potential response from Blacks is that they hide their Black identity to blend into the dominant White workplace culture. To study this situation, we offer an extension to the work of Wendy Faulkner and her concept of in/authenticity that women in engineering experience in a male-dominated field. We shift this lens to the experiences of race rather than–and in some instances in addition to - gender and focus on Blacks within engineering. This paper also presents a framework derived from Ibram X. Kendi's *Stamped from the Beginning: The Definitive History of Racist Ideas in America.* Kendi expresses three stances on race: segregationists, antiracists and assimilationists. We use these personas to investigate their occurrences and effects on the experiences of Black engineers.

We are using these two complementary frameworks in our own work to interrogate the personal and structural aspects of racialized experiences in the engineering workplace. The workplace culture that surrounds Black engineers is expected to shape their in/authentic experiences. Together, these frameworks provide a means to uncover how the in/authentic identities of Black engineers result from anti/racist ideas in the workplace. We are in the beginning stages of data collection; therefore, this paper will solely focus on how we aim to apply the theories of race that are outlined. The overall intention of this presentation is to provide conceptual and theoretical guidance to others in studying various aspects of engineering.

**Introduction**

Critical race scholarship gained popularity in legal studies in the 1980s and has continued to grow within academic scholarship. A highlight of this movement was the use of critical race theory (CRT) in research which explores society and culture in relation to race, law, and power [2]. CRT recognizes that White supremacy is maintained in order to hold power of one race over another, and that racism is engrained in the U.S. In recent years, it has become a powerful tool to fight social injustice and bring about societal and political change in the United States. Upon reviewing the literature, most writings of critical race studies have not strayed far from conventional practices of legal and educational scholarship [3]. Race studies must transcend disciplinary boundaries to collectively exploit, dismantle, and reshape racist policies that permeate in America.

At the 2018 ASEE Annual Conference, Pawley et al. called for increased use of CRT in engineering education research [4]. To answer this call, this conceptual essay highlights the strengths and need for more studies within engineering education that uncover both the structural and individual impacts of racism in the field, specifically within the engineering workplace.

Structural racism is embedded in our social structures and individual psyche [5]. In contrast, individual racism views racism as a system of beliefs, or psychological constructs of people [5]. This framing provides a way to understand the history of engineering and the experiences of Black engineers, who are described as putting on and taking off masks [6], [7] in situations to hide their authentic selves to blend into the dominant culture of their workplace.

We begin this paper with a review of CRT and the current research on the experiences of Black engineers. Next, we present two analytical frameworks: Kendi's history of racist ideas [8] and Faulkner's in/authenticity [9]. Pieces of Kendi's work, when posed as a conceptual framework, provides insights needed to recognize and dismantle structural racism. Faulkner's framework provides a tool to understand how workplace culture impacts an individual's ability to authentically be themselves. Together, we see the structural and individual frameworks as means to interrogate racism holistically. In the following sections, each framework will be explained and the importance of their use in tandem will be discussed.

**Critical Race Theory**

Critical race theory is often mistaken as a broad field of study. CRT is a theoretical framework that argues that race is socially constructed in order for Whites, who create race, to maintain their power. With this framework, society does not view race as biological and natural, rather it uses race as a means of oppression to gain advantage. Advantages held by Whites emerge from bias, social, economic, and legal means. This then fuels the growth of poverty, labor markets, criminal occurrences, and overcomes the chances for Non-White races to excel. According to Ladson-Billings and Tate, three central propositions base the social inequality at hand [10]. These propositions are that race still plays a role in determining inequality in the United States, the U.S. is still societally based on property rights, and this intersection of race and property rights create a lens for analytical use to understand the underlying social inequality [10].

Critical race theory is typically portrayed as having five tenets, although the exact tenets differ between theorists. These tenets form its methodology, direct theorists' pedagogy, and drive its research. DeCuir and Dixson [11] describe the original tenets as:
1. Counter storytelling - giving a voice to marginalized people in order to expose normalized racial experiences
2. The permanence of racism - accepting the realist position that racism is endemic and permanent
3. Whiteness as property - exposing that Whiteness gives rights to possession, enjoyment, exclusivity, and disposition
4. Interest convergence - recognizing that opportunities for Blacks are given for the self-interest and benefits of Whites
5. The critique of liberalism - combatting the colorblind, neutrality of law, and incremental change that liberal ideology believes

Other important aspects of CRT that are sometimes included in other versions of the tenets are its commitment to racial justice, the social construction of race, intersectionality, and non-essentialized experiences. Particularly important for this paper is the realization of intersectionality, the reality of how other facets play into an individual's lived experiences

including their roles within race, class, gender, and sexuality. These identities are recognized in CRT for their intersections that create multiple modes of oppression. Awareness of intersectionality is crucial in critical race studies because it cautions against essentialism. Essentialism is a belief that there is a monolithic experience and it reduces the lives of those who experience multiple forms of oppression to simplistic, generalized descriptions [12]. The use of intersectionality and avoidance of essentialism is important when researching individual and structural acts of racism in engineering for many reasons. It is expected that intersectionality of gender and race will appear, given that the engineering field is dominated by White males [13].

CRT recognizes that the centrality of race in the U.S. was formed in conjunction with the creation of the nation as a social project. Critical race theorists identify that race is indicative of not just the creation, but its continuation each day [14]. Although we are using two frameworks to look at individual and structural racism from a critical perspective, we recognize that these frameworks are not part of critical race theory.

## Engineering Education and Critical Race Studies

Engineering education research focuses on guiding the future engineering practice towards improved quality and diversity. Some engineering education researchers investigate the field's persistent racial homogeneity [4]. There is constant talk about the need for diversity, and efforts are made through "minority in engineering" programs. Yet, engineering is dominated by White males [4]. Moreover, engineering education scholars are only just beginning to incorporate critical race theories into their research on diversifying engineering. For instance, Pawley et. al conducted a literature review within engineering education journals and proceeding [4]. They found 138 articles that used terms associated with diversity and inclusion (e.g. racism, funds of knowledge, colorblind, etc.). While the field recognizes the need to better understand these issues, their review suggests that CRT is not yet widely used within engineering education. The engineering workplace has recognized the need for diversity but lacks success in action and maintaining these efforts. Engineering education research is needed to close the gap between purported intention and action to increase diversity in engineering.

In reviewing the literature on studies within engineering education that focused on race, various frameworks have been used (e.g. identity [15], [16], self-efficacy [17], tokenization [18], and inclusion/exclusion [19], [20]). While these perspectives are valuable, we suggest other critical race frameworks can be used to reveal aspects of racism in engineering. We are proposing two frameworks to assess individual and structural racism within engineering education studies. In order to evaluate structural racism, we propose the use of Kendi's history of racist ideas [8]. To examine individual racism, we suggest Faulkner's concept of in/authenticity [9].

## Structural Racism

Structural racism affecting diversity and inclusion is often explored through historical analysis. Historical analysis of the construction of racism provides a tool for the critical theorist to analyze the deep roots of racism that still permeates today. Many theories exist that define the path of structural racism. For example, one of the more well-known historical analyses of the construction of race in the US is that of Omi and Winant [21]. They outline the historical use of

race for social distinctions in order to allow power and domination of one race over another. Another similar theory of structural racism is Fanon's *Black Skin White Mask*, which explains that racism is the result of colonization and the force of power dominance of Whites over Blacks [22].

Engineering education has its own history of unequal education for Blacks and Whites stemming from structures and policies in different eras [23]. Slaton found that power has been used by White engineers to marginalize Black engineers, and to maintain this status through their education [23]. However, there is an overall lack of literature that looks into the structural racism that pertains to engineering. The historical understanding outlined by Slaton leads us to focus on structural racism within engineering. We offer Kendi's history of racist ideas as a framework for use within engineering.

**Kendi's History of Racist Ideas**

Ibram X. Kendi's *Stamped from the Beginning: The Definitive History of Racist Ideas in America* provides a conceptual framework for analyzing structural racism [8]. Kendi critically analyzed the ways in which racist policies impact the perception of Blacks. Kendi explained that "the actual foundation of racism is not ignorance and hate [like we are taught], but self-interest" [as cited in 24]. He described the relationship between racist ideas and racist policy as the desire for advantage by powerful Whites, who then create racist policies, which then causes racist ideas; rather than racist ideas driving racist policies, which cause advantage. In his words, Kendi stated, "Ignorance/hate → racist ideas → discrimination: this causal relationship is largely ahistorical. It has actually been the inverse relationship- racial discrimination led to racist ideas which led to ignorance and hate. Racial discrimination → racist ideas → ignorance/hate: this is the causal relationship driving America's history of race relations" [8, p. 9]. With this, we must step back and reassess the history of racist ideas in America with a focus on the structural policies put in place by those in power. "Hate and ignorance have not driven the history of racist ideas in America. Racist policies have driven the history of racist ideas in America" [8, p. 9]. Although this seems like a simple relationship, there are caveats that provide complexities within it. The complexities range far beyond what is stated here, though it does provide a solid foundation to begin the examination of racism in engineering.

Kendi simply defined racist ideas as "any concept that regards one racial group as inferior or superior to another racial group in any way" [8, p. 5]. He also defined anti-Black racist ideas as "any idea suggesting that Black people, or any group of Black people, are inferior in any way to another racial group" [8, p. 5]. This historical framework looked at racist ideas from policies in place rather than hate and ignorance that occurred.

Kendi provided many instances of policy making starting with the slave trade in 15th century Europe to present day occurrences. One distinct example was the revocation of Black rights during post-Reconstruction in the United States. This was done to protect the farms and livelihood of Whites. This is an example of racist policies for advantage, not hate/ignorance, that ended up with justification from racist ideas. A racist idea that stemmed from this was that land redistribution (i.e., the "40 acres and a mule" policy) "would 'ruin the freedmen' by leading them

to believe that they could acquire land without 'working for it', as the antislavery cotton manufacturer Edward Atkinson suggested" [8, p. 236].

Another significant element of Kendi's structural analysis was his outline of three stances – segregationist, antiracist, and assimilationist – people held about racism. "A group we can call segregationists has blamed Black people themselves for the racial disparities. A group we can call antiracists has pointed to racial discrimination. A group we can call assimilationists has tried to argue for both, saying that Black people and racial discrimination were to blame for racial disparities" [8, p. 2].

In sum, segregationists would say that Blacks are naturally inferior. Antiracists would argue that racial discrimination creates inequalities, and that Blacks are not inferior by any means. Assimilationists would also agree that yes there is racial discrimination, but Blacks are not *naturally* inferior. They believe conditions have directed them to become inferior. Throughout history, the assimilationists would challenge racial discrimination while trying to "civilize and develop" Black people [25], itself a racist policy.

The assimilationist ideas that resonate throughout society and workplaces are toxic. They insinuate that Blacks need to be "improved" to "fit in" to society, which is blatantly racist. Kendi centers on the discriminatory policies in place, causing these policies to be identified and dismantled in order to eliminate racism [24]. Although Kendi did not explicitly frame his historical analysis for use in social science research, it can still be used to expose the racist ideas behind the experiences of Blacks in engineering. By using Kendi's three identities along with his relationship that drives racism, an analytical framework to investigate structural racism in engineering emerges.

**Individual Racism**

Blacks experience individual acts of racism from the workplace culture they are surrounded by. We describe individual racism as individual acts of racism by a member of a dominant group, that occur within a larger structural aspect of racism. Examples of the manifestation of individual racism would include acts of microaggressions and judgement within the workplace. Douglas, Richardson, and Dupuy found that "Participants dealt with indirect negative statements related to race, condescending emails because of race, and being judged explicitly based on skin color" [26, p. 5]. These would all exemplify acts of individual racism which we are investigating.

Many authors have pointed out the tensions created when Blacks are forced to function in a cultural setting created by Whites [10], [15], [16], [19], [27], [28], [29], [30], [31]. Anzaldúa described the masks, or differing personalities, that people of color have worn by stating "the masks, las máscaras, we are compelled to wear, drive a wedge between our intersubjective personhood and the persona we present to the world" [6, p. xv]. Camacho and Lord explained that these "wedges" drive Latina engineers into a professional borderland [32].

Research has demonstrated the ways the dominant White male culture of engineering leads to cultural mismatch, identity conflict, compartmentalization of work and social lives, diminished job satisfaction, and psychological stress for Blacks [15], [16], [19], [29]. Wendy Faulkner's

concept of in/authenticity provides a means to understand individual racism in engineering. This framework was created in engineering research to understand how women navigate the male-dominated field. The findings from studies that utilized this framework are applicable to race. It is expected that similar outcomes will emerge. Transferring this framework from gender to race will allow an in-depth exploration of individual racism within the workplace.

**Faulkner's In/authenticity**

Wendy Faulkner began her studies on the experiences of women in the software industry with a discussion of engineering dualities [33], [34]. Through this work, she described two sides of engineering, the "technical" and the "social", which are in tension. The technical realm is often considered "real" engineering where men are expected to hold positions. The "social" realm is where women are expected to participate. She described the "gender inauthenticity" [34, p. 93] that ensues when women enter the software engineering field. Faulkner continued this research path and developed her gender in/authenticity in later work [9], [13], [35].

Faulkner collected data from various engineering firms in order to demonstrate the claim that women in engineering have to "fit in" to "a masculine culture". She found that both men and women had gendered interactions, like topics of conversation, humor, and social networks, that made them feel like they didn't belong [9]. She concluded that "engineering and pleasure in technology are (felt and perceived to be) 'gender authentic' options for men and 'gender inauthentic' options for women" [9, p. 172]. Throughout her research, she found that in some cases similar roles were perceived as more gender authentic for either men or women. Faulkner stated, "moving into management and business roles is likely to feel, and be perceived as, more 'gender authentic' for men engineers, *to the degree that* these jobs carry real authority over others and/or deal with commercial, profit and loss aspects of running the business. Moving into management and business roles is likely to feel, and be perceived as, more 'gender authentic' for women engineers *to the degree that* these roles draw heavily on interpersonal skills, as in team management or customer relations" [35, p. 348, italics in original]. The technical aspects of the job were deemed as "real" engineering, and other roles outside of this were deemed more "gender authentic" for women. Thus, women lost their statuses and identities of being "real" engineers. Faulkner did note that in actual practice, it is not quite as obvious.

Taking this in/authenticity perspective and turning it to race holds much importance due to similar interactions experienced by non-White races, specifically Blacks. Faulkner alluded to this in stating that "…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" [13, p. 6].

Faulkner's in/authenticity is particularly relevant to studies of racism in engineering because it was developed for engineering. The stereotypical image of an engineer is a White male. "Numbers matter; they send a signal and shape our expectations–when people think 'engineer', they envisage a man" [9, p. 173]. Faulkner extends her use of the term gender in/authenticity to capture "the normative pressures of the way things are" [9, p. 173], in order to expose the socially constructed beliefs we hold. While Faulkner focuses on gender, there is alignment

between her framework and Helms's and Piper's framing of racial and vocational identity development [36]. Helms's and Piper's conformity status corresponds to Faulkner's description of inauthentic experiences, while Helms's and Piper's internalization status corresponds to Faulkner's authentic experiences. Additionally, we are aware of the potential legal implications of some of the participants' lived experiences and are mindful of the exponential weight of intersectionality [37] and the analytic tools offered by critical race theory (e.g., foregrounding race/racism; focusing on racialized, gendered, and classed experiences; using interdisciplinary understandings) to bring the issues to the fore [38].

In reviewing the literature, we note that socially-constructed beliefs and subsequent behavior – and vice versa – within engineering lead to cultural mismatch, identity conflict, compartmentalization of work and social lives, diminished job satisfaction, and psychological stress [15], [16], [19], [29]. The individual impact of racism can be assessed through the experiences that lead to in/authenticity.

**Assessing Structural and Individual Racism Together**

In this paper we propose the use of Kendi's historical analysis of racist ideas in America [8] and Faulkner's concept of in/authenticity [9] to understand racialized experiences within engineering. With narratives, specific anti/racist ideas discovered within engineers' experiences can be examined and shared. Typically, researchers explore racism separately, as a structural or individual issue. At the individual level, implications include training and educational programs in organizations [5]. Researchers advocating the structural approach "believe that such [individual] approaches ignore larger issues of policy, law, segregation, discrimination, and media/rhetoric that produce and reproduce racist beliefs or create an environment that makes them grow" [5, p. 12]. By bifurcating racist experiences, the complexity is minimized, and the complete picture needed to dismantle racism is missed. The use of structural and individual frameworks in research will provide the lenses needed to begin to interrogate racism holistically.

When pairing the frameworks of Kendi and Faulkner, it is expected that at a structural level, the ideas that define the culture of engineering also determine the ability of engineers to authentically be themselves. In other words, in/authenticity is caused by assimilationist racist ideas. These ideas include the ideas that Blacks need to "fit in" to engineering and engineering cultures to be prosperous. As Faulkner states, "Workplace cultures not only oil the wheels of the job and the organization; they can also have a huge bearing on who stays and gets on in engineering" [13, p. 3].

By employing both frameworks, we can explore the experiences that occur from the new sequential idea that racial discrimination creates racist ideas, which leads to ignorance and hate, and ends with in/authentic experiences. Therefore, building on Kendi's model, we get: racial discrimination → racist ideas → ignorance/hate → in/authenticity.

The United States is in a toxic cycle of structural racism perpetuating individual racism. The process repeats time and time again. By exploiting both structural and individual racialized experiences, we can begin to combat racism in different settings.

**Application of the Frameworks**

A review of the literature shows that there has been only limited research understanding the experiences of Black engineers in the workplace. Our current project aims to fill that gap. Details of the project are provided in another conference paper in this proceedings [39].  Specifically, we are using the frameworks of Faulkner and Kendi to directly understand instances of racism in the workplace and how they affect the workplace culture.

The two frameworks provide complementary lenses through which to analyze the interviews we are collecting. In/authenticity allows us to understand how individual acts of racism impact the engineers. In our early pilot data, we have noticed that the small numbers of Black engineers in the workplace can lead to feelings of tokenization. Response to this tokenization can vary, leading to inauthentic experiences such as trying to fit into the workplace, yet also leading to authentic experiences such as proudly embracing their identity.

However, from the tenets of CRT we can see that in/authenticity only provides a partial understanding. CRT requires that we also consider racism as institutionally and structurally constituted. That is, racism does not just exist in individual acts, but in the structural elements that maintain the power and dominance of Whites. Kendi's history of racist ideas provides a framework for understanding those structural elements. In the stories of our participants we look for ways in which the individual acts of racism are created from and supported by structural desires for advantage. For example, in pilot interviews employee resource groups based on shared identities such as race, gender, and sexuality were seen as very important tools for connecting employees within a company. However, in today's 'post-racial' climate such groups are seen as 'advantaging' Blacks. In terms of Kendi's framework, the desire of Whites to maintain their dominant position in the workplace leads to companies not supporting these employee resource groups. They then justify this lack of support through notions of 'reverse discrimination'. These institutional acts of racism then lead to inauthenticity due to the lack of spaces where Blacks can support each other.

The individual narratives we develop from our participants' stories will incorporate both the individual and structural aspects to explicitly call attention to racism within the workplace. Thus, we aim to make connections and provide example cases depicting that the ways in which racial discrimination → racist ideas → ignorance/hate → in/authenticity.

**Implications for Engineering Education**

With this paper, we aim to advance awareness and action within engineering education. The frameworks discussed have utility for studying many aspects of engineering. For example, we are applying these frameworks within the computer and information technology industry for our own study on engineering workplaces. While studies have examined ways Blacks cope in their workplaces, and address the way workplace culture affects Blacks, very little has been done to understand the manifestation of individual and structural racism that exist in engineering workplaces. Through narrative analysis we are using Faulkner's in/authenticity and Kendi's history of racist ideas to directly interrogate instances and experiences of racism. Doing so adds

additional depth to the extant research and allows us to understand what structures need to be dismantled to create true cultures of inclusion.

There are many other aspects of engineering education research where these frameworks could be of use. For example, there have been various studies published assessing the effectiveness of minority engineering programs (MEP; see for example [40]–[43]). This line of research could benefit from the use of Faulkner's and Kendi's frameworks to investigate specific instances of individual and structural racism. To illustrate, we look to Murphy et al.'s assessment of Georgia Tech's summer bridge program, the Challenge Program, and its role in the higher likelihood of graduation for underrepresented minority students involved [42]. Georgia Tech is a Predominantly White Institution (PWI). Murphy et al. found that there was a significant relationship between participation in the Challenge Program and increased retention/graduation rate [42]. Quantitatively, they recognized the need for summer bridge programs and the program's importance in retention. What their study was not designed to answer was the reasons for the success of this program. One potential avenue would be to use the frameworks presented here, or other critical race frameworks, to understand the engineering culture at this institution that the MEP has countered to provide success for minority students. Using critical lenses would provide more specific feedback and actions to improve institutional cultures.

As another example, Good et al. used a mixed methods approach to assess the MEP of a large land-grant university [40]. They quantitatively assessed the minority engineering program and qualitatively assessed the experiences of 6 non-MEP Black students and 6 MEP Black students. They asked the participants if they felt they were treated differently due to their ethnicity. Eleven out of the 12 stated that ethnicity was not an issue within the engineering program, suggesting that they do not feel the need to put on a mask to succeed. Again, additional studies could explore this finding further, using critical frameworks to understand why the students felt this way, what the culture of this program was like, and how the culture was positive for Black students.

Engineering education is a vast field, with many areas of research that could benefit from deploying similar studies. Studies could be used to explore experiences of faculty, students, Predominantly White Institutions, Historically Black Colleges and Universities (HBCUs), different fields of engineering, and so on. Bringing more critical and/or race-based studies into engineering education would aid in the fight for racial justice.

**Conclusion**

Ibram X. Kendi argues that love, education, and activists will not end racism, rather, dismantling the policies in place will begin to eradicate it [24]. With this paper we begin to heed Pawley et al.s' call for more use of critical frameworks in engineering education [4]. We advocate for an expansion of critical race research within the field of engineering in order to push beyond CRT's traditional legal and educational scholarship. As Faulkner stated, "engineering workplace cultures have to become much more welcoming, comfortable and supportive places… for groups who are currently in a minority or marginalized in the profession – if they are to avoid losing or underutilizing their talent" [13, p. 16]. By coupling Kendi's history of racist ideas and Faulkner's

in/authenticity, experiences of structural and individual racism can be found in order to dismantle the racist policies in place.

## Acknowledgements

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