

BOARD # 361: EDU Racial Equity Year 3: A Professional Development Program in Examining Whiteness in Engineering

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Introduction

This collaborative project, funded by the NSF's EDU Racial Equity Program, aims to shift the way faculty understand racial equity in engineering education. Rather than treating "underrepresentation" as the result of an inherent deficit in people of color, this project explores the ways the invisible and normalized nature of Whiteness in engineering has led to systemic barriers for students and faculty of color. We find that these barriers are consistently ignored, making it difficult to identify, challenge, and (re)imagine racial equity in engineering. In order to challenge the hegemonic discourse of Whiteness, engineering faculty must develop the ability to see and name these invisible forces. Our milestones for achieving this goal include: 1) conducting a collaborative autoethnography; 2) creating a development program focusing on fostering and developing critical consciousness to reveal these underpinnings of engineering culture; and 3) engaging engineering faculty, staff, and students to critically reflect on their own positionality, question structures of power (such as the social, cultural, historical and political effects of Whiteness in engineering), and become change agents for racial equity in engineering education. This paper focuses on the second goal, helping faculty develop their critical consciousness, as we launch our professional development program in Year 3 of the project.

Using Critical Literacies to Develop Critical Consciousness

Our development program aims to engage engineering faculty in a process of "unlearning the codes of what it currently means to be White" [1, p. 94]. Our objective is to help engineering faculty develop critical consciousness by actively engaging with critical literacy practices to understand and dismantle the barriers that consciously or unconsciously they may be placing in their own engineering classrooms, interactions with students, and/or their daily lives.

Paulo Freire described the development of critical consciousness as a five-stage process, although it is important to note progress through the phases is not necessarily linear [2]. The **first stage** starts with the individual being in a *semi-transitive state*, preoccupied with survival. In the **second stage**, the individual has moved to a *transitivity of consciousness*. As individuals increase their capacity to dialogue with others they become "transitive." This state of transitivity allows individuals to reflect on themselves, their roles and responsibilities, and to dialogue with others and the world. This stage seeks to replace the disengagement from their existence to a total state of engagement with their surroundings. While communicating with others, some individuals are predominantly in a stage of *naive transitivity* which constitutes the **third stage**. Naive transitivity, according to Freire, is characterized by "an oversimplification of problems; ... by a lack of interest in investigation, accompanied by an accentuated taste for fanciful explanations; by fragility of argument; by a strongly emotional style; by the practice of polemics rather than dialogue" [2, p. 14]. Thus, naive transitivity describes the consciousness of an individual whose capacity to dialogue is still fragile. If the individual achieves the progress desired, the individual

will reach the **fourth stage**, *critical transitivity*, which is characterized by a more in-depth analysis of problems and an increase in agency, or ability to take action. There is a “depth in the interpretation of problems” [2, p. 15] and a “highly permeable, interrogative, restless, and dialogical form of life” [2, p. 15]. The progression requires an “active, dialogical educational program concerned with social and political responsibility” [2, p. 15]. In the **final stage**, the individual is finally able to move to a state of “*critical consciousness*,” which represents the awakening of critical awareness emerging from a critical educational effort [2, p. 15].

Program Development

A major outcome of our project is to create a professional development program to better equip faculty to interrogate and dismantle the systemic barriers of Whiteness in engineering education. As learners encounter information that challenges their deeply held beliefs, analytical reasoning is used to interrogate how this information impacts their worldview. Drawing upon our own experiences in teaching and research [3], we acknowledge it is hard to do this work -- grappling with these topics requires trust, humility, vulnerability, and a willingness to sit with discomfort.

Our 8-session program is open to staff or faculty members of any rank who are currently affiliated with an engineering program at a U.S.-based academic institution. The program is designed to help participants understand, critically examine, and take action regarding Whiteness in their professional environments. The program follows Bloom’s taxonomy to progress from foundational knowledge to application and critical reflection, while also incorporating the stages of racial identity consciousness. The first cohort will meet monthly online to explore topics such as: racial equity, Whiteness in engineering spaces, unpacking privilege and challenging Whiteness, embracing racial identity, building inclusive engineering cultures, advancing critical consciousness, and implementing change in engineering practice. The sessions aim to blend theoretical understanding, reflective activities, and practical applications. We hope to help participants build a network of peers who fight for racial equity, discover ways to persist and thrive in White academia, and expand their research portfolio to incorporate what they have learned about critical consciousness and racial equity.

As a part of the program, we will outline for participants the epistemological obstacles (i.e., the tendency to rely on deceptive intuitive experiences; the tendency to generalize; and the obstacles caused by natural language) [4], [5], [6] that may perpetuate scripts of Whiteness, and how Whiteness may be manifested in our own spaces. The program will provide a primer on the culture of Whiteness in engineering education and include some common readings to help participants build vocabulary and understand the theories behind these topics. We will then lead participants into activities to help them “practice” revealing the invisible, beginning by examining a series of vignettes. These vignettes will be used as a pedagogical intervention to illustrate the narratives of different actors (i.e., engineers) confronted with situations that continuously reproduce social inequities and hierarchies through scripts of Whiteness. One of the vignettes, for example, may include information about how media represents people of color (something that is seen across institutions through textbooks, advertisements, recruitment videos,

etc.) and the particular issues it may reveal such as colorblind racism in engineering, power dynamics, discrimination, eurocentrism, and oppression [7]. Another example may explore real-life case studies from the PIs' interactions, for example where a white man was given preferential treatment by administrators, but a critical awareness enabled him to intervene on behalf of faculty of color. These vignettes are intended to guide and help participants deconstruct the scripts of Whiteness -- an initial step in the development of critical consciousness. Drawing from Freire's work on the five stage process for the development of critical consciousness [2] and critical literacy [8], we argue that the exposure to these real scenarios will encourage participants to accept, reject, or reframe different ideologies presented in these vignettes while at the same time (re)situating themselves and their role in engineering spaces. The program activities will be grounded in critical literacy, which will draw material from not only these vignettes, but also other texts, documentaries, guest speakers, etc. (for example, [9], [10], [11], [12] to critically analyze the power that emerges from language.

As participants become familiar with critical literacy as a tool, they will gain the skills to continue developing their critical consciousness without direct scaffolding from the PIs, such as after the conclusion of the program. Building this independence is important for realizing that there may not be a "right answer" in a real situation, and that a critical consciousness is not parroting a "correct" ideology but rather enables a deeper understanding of their own world and the ability to intervene in one's reality.

Assessing Participants' Growth in Developing Critical Consciousness

The basic research design is a mixed methods, change-over-time model, designed in light of the exploratory nature of the project to capture as much information as possible regarding critical interactions and experiences that shape the participants' knowledge and awareness of Whiteness as a systemic barrier in engineering. We recognize that not all participants may enter the program with a heightened level of critical consciousness. Many may hold contradictory ideologies or conflicting perceptions of and about Whiteness. Thus, participants from all ends of the critical consciousness continuum will utilize the space provided by the facilitated community of practice to reflect on their own positionality and critically analyze their own understanding and awareness of their surroundings in collaboration with others within that continuum [14]. We will collect data from pre and post surveys completed by participants using the Contemporary Critical Consciousness Measure I and II [15], [16]. The data collected will help determine how participants respond to issues impacted by the scripts of Whiteness in engineering such as racism, classism, heterosexism, and ableism before and after the program.

This information will be complemented with a direct analysis of the participants' responses to journaling and selected individual interviews. All participants will be asked to complete journals where they will describe their learning experiences focusing on five elements: (1) what they learned; (2) how they learned it; (3) which thoughts, feelings and concerns were involved in the process; (4) what served as the purpose for the learning experience; and (5) how other people were involved [17]. The journals will be collected electronically for analysis. The purpose of this

data collection is to not only learn about the experiences of participants, but also to understand the impact of social and interactive processes of the co-constructed effort.

In addition, data will be collected from interviews with participants as complementary qualitative, rich and in-depth data. We will investigate participants' development of critical consciousness through entry and exit semi-structured interviews. These interviews will include questions such as: (1) What (changes) have you observed in your own awareness of how Whiteness manifests at your institution? (2) Where on the critical consciousness continuum do you think you stand and why? (3) How and in what ways have you taken action when you encounter scripts of Whiteness in engineering? and (4) In what ways have you engaged in critical praxis in engineering? For example, we hope outcomes from developing critical consciousness might include changes made to course materials, or to hiring processes for those involved in faculty searches. Both the interviews and the journal reflections will be analyzed through an open deductive process [18] to identify how participants develop critical consciousness as indicated by Freire's model [2]. A list of *a priori* codes will be used from Freire's model to identify how participants move through the different stages in the continuum of critical consciousness. The codes will be refined until we reach a point of consolidation of the data [19].

As a part of our analysis, we will conduct member checking both with participants in assessing their growth in developing critical consciousness (to enhance the trustworthiness of results), as well as with our advisory board members who have expertise with qualitative research (as a validation technique) [20]. It is important to note here, and for participants in this process, that even though we are measuring growth in critical consciousness, this work is on-going and nonlinear; there is no "completion" stage in critical consciousness. We will use information collected from participants about the efficacy of specific pedagogical interventions to co-construct and revise the transformative learning experience for future participants.

Conclusion

Our hope is that our group of participants will naturally develop into long-term communities of practice [21] for faculty to lean on as they bring lessons learned back to their own units as change agents. Challenging racial inequity in engineering education begins with developing a critical consciousness and examining one's own identity and positionality in engineering spaces. Challenging the systemic barriers in engineering education will be a career-long endeavor, and our goal is to start our participants down this path. Our program aims to provide participants with tools and skills, and build pathways that they can continue along, in whatever direction makes sense for their role and at their institution, to empower them to begin decentering Whiteness from their ways of thinking and move engineering education towards racial equity.

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